United States Court of Appeals

for the Second Circuit

APPENDIX

75-7362

United States Court of Appeals
FOR THE SECOND CIRCUIT

Docket No. 75-7362

B

PERMA RESEARCH & DEVELOPMENT COMPANY,

Plaintiff-Appellee,

—v.—

THE SINGER COMPANY,

Defendant-Appellant.

ON APPEAL FROM THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF NEW YORK

UNITED STATES COURT OF APPEALS
FILED
DEC 29 1975
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SECOND CIRCUIT

JOINT APPENDIX

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All Exhibits are located in a Separate Exhibit Binder.

been identified?

MR. GRAND: I think the witness identified him as --

THE COURT: I believe he said it was Mr. White, a director of the organization in New Hampshire; is that correct?

THE WITNESS: I said Mr. White was a director of Motor Vehicle Research of New Hampshire.

Q I gather he was the person you were dealing with up there at the Motor Vehicle Research of New Hampshire during these tests in 1959?

A Well, he was the fellow that -- yes, that I dealt with. There were other people that I talked with. He was the fellow I dealt with.

Q Did he become a shareholder and a director of Perma on or shortly after its formation?

A Yes, after the tests were conducted we became friendly, and I asked him, because he had been testing for the automotive industry and for some of the -- he was familiar with automotive products, and I asked him if he would be interested in participating, and he became subsequently a stockholder upon the formation of the company.

He received, I think, 10 per cent of the stock in the company.

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DIRECT EXAMINATION CONTINUED

BY MR. GRIMD:

Q Did there come a time, Mr. Perrino, when Perma placed its first mass production order for the Perma anti-skid control?

A Yes, there was.

Q Can you tell me when that was?

A I think this was late in 1963 or early in '64, with Worcester Stamp Metal Company of Worcester, Massachusetts.

Q Is that a subsidiary of any other company?

A Yes. It's a subsidiary of Rice Barton Company.

Q What was the size of the order placed with Worcester Stamp Metal Company?

A I believe it was in excess of one million two or something of that nature.

Q You are talking in terms of dollars?

A Dollars, 1.2 million, I think. I am not sure of the exact figures.

Q I am talking in terms of units.

A Well, it was 50,000 anti-skid units, completed units, and then I think it was 150,000 of the adapters, so they would fit various cars.

Q Did you receive all 50,000 at any one point?

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them.

Q Can you tell me when your first contact was with the Singer Company?

A I think that was also in January.

Q Of 1964?

A Yes. It was Singer's Canadian -- somebody from Canada. I guess their Canadian manufacturing company.

Q Before we get into the details of the contracts with Singer I want you to describe for us in detail the invention and the state of the invention at that point in time, namely, early 1964.

To facilitate that, we have a diagram and some cutaways of the unit.

MR. GRAND: We have, your Honor, marked as Exhibit 5 a diagram of the Perma anti-skid control and as Exhibit 5-A either a reduction of 5 or 5 is a blow-up of 5-A. I think 5-A is the original diagram and I think that 5 is a blow-up of it.

Can I hand a copy of that to the Court so that you can follow this as well.

THE COURT: Yes.

MR. GRAND: I believe defense counsel have a copy of this.

MR. BENBOW: We had one.

MR. BENBOW: Not entirely. The specific point as to the air filter apparently you met, but I am not sure that this device as shown there has been established to be the same thing that is shown on the chart.

THE COURT: I think Mr. Perrino said for illustrative purposes it doesn't much matter, and I can't see how it does. What he is going to do is try to explain how the basic concept works. Is that correct, Mr. Grand?

MR. GRAND: Yes, your Honor.

THE COURT: All right, let's go ahead and explain it.

THE WITNESS: I started to explain to you earlier how a braking system works. I'd like to go into that further because this affects the braking system when it's in operation, and in order for you to understand it, I'd like to go into that just for a minute.

THE COURT: Try to keep your voice up. I assure you if I was seated on the end I wouldn't hear you, sir. Please keep your voice up.

THE WITNESS: Can I turn the blackboard this way a little more? Can you see it?

THE COURT: It doesn't matter if I see it.

THE WITNESS: This represents a brake pedal on an automobile. This represents the master cylinder,

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which is that black unit that I indicated was a master cylinder, and these lines here represent the lines which go to the wheels, and this represents the brake that would be inside each wheel. There is a wheel and a tire that goes around this, but this would indicate the brake assembly.

This works by moving fluid, which is oil. When the operator of the car depresses this pedal --

Q By "this pedal," that is the brake pedal?

A The brake pedal.

THE COURT: The brake pedal which is shown on this exhibit right in front of the thing identified as the master cylinder. Go ahead.

THE WITNESS: Yes. When this brake pedal is depressed, there is a rod that is connected to it that slides inside the cylinder.

This is made up of a reservoir which holds oil, and nothing more than a tube here with a seal in it.

So that when the brake pedal is depressed and the rod moves forward into that cylinder, it pushes the fluid from the reservoir into the lines, and when the operator removes his foot from it, the oil or the fluid comes back into the reservoir.

When the brake pedal is depressed, the fluid goes through these lines into each wheel. It goes in

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four directions. The reason they use fluid is to make it equal because the fluid goes in four directions -- will go in all directions at once.

It goes into this cylinder, which is another cylinder like this one with seals on both ends.

Q When you say this cylinder, you mean something labeled "Wheel Cylinder"?

A Yes, inside each wheel is a wheel cylinder. The fluid goes into that cylinder, and it is contained there by seals, which are rubber cups.

When the driver pushes down the brake pedal, the fluid goes through these lines and pushes against these cups and pushes these two pieces, which are brake lining, outwardly, so that it makes contact with the inner drum of the wheel, so that it can increase the pressure or retard the rotation of the wheel, slow it down.

The more pressure that is applied on the pedal, the more fluid goes through these lines, and the more pressure is applied against the wheels, so that they can either stop the car in an abrupt manner or gradually, depending on how much pressure is applied on this pedal.

If the driver is driving along on a dry pavement, and he merely wants to slow down, he pushes a small amount of force on this pedal, and the car slows to a gradual

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is then returned to the normal braking system of the car?

A That's right.

MR. GRAND: I think that completes the explanation, your Honor.

THE COURT: All right. Let's move forward.

MR. GRAND: I am sorry. It doesn't, your Honor. I did leave something out.

BY MR. GRAND:

Q Is there a portion or a part of this unit which you have called a fail-safe feature?

A Yes, there is.

Q Can you tell us what part or parts of this unit comprise the fail-safe feature?

A It's a combination of the last parts we talked about, the cam gear --

Q Please, again, speak slowly.

A The cam gear, the armature, the solenoid and the armature --

Q What is the armature?

A The armature is that piston. I just read it off to you. The piston that we have been talking about that is affected by magnetism in the solenoid.

Q It is that steel shaft inside the solenoid?

A The steel shaft, yes. It would be the cam gear, the solenoid and the hydraulic pressure switch.

Q Can you tell us what function that fail-safe feature is intended to perform?

A Yes. We mentioned and we have been talking about right along that it senses wheel rpm. The sensing unit responds to a decrease in the locking of the wheels.

Q What is wheel rpm?

A Wheel speed.

Q You mean revolutions?

A Revolutions, yes. The sensing unit detects a locked wheel or a stop or a decrease in speed of the drive train. If for some reason this drive train broke, such as the flexible shaft or the gearing, then a false signal would come into the unit indicating that the wheels are skidding when in fact they may not be.

Q Can you explain that? Why do you describe that as a false signal?

A Well, because -- let's go through the last operation of the unit functioning and let's break the cable or attempt to show the cable snapping in this instance and I will explain how this reverts back to the

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standard braking system.

If you were driving along and the driver slammed on the brakes and the wheels locked and the drive shaft and this entire drive train locked -- we told you that the twisting force of these parts activate the unit, so if the drive shaft broke before this twisting action was set up the unit would not be turned on and the unit would just not come into play.

If the unit --

Q What would happen?

A The regular brakes would be operative the way they were because the unit did not go on.

Q What would happen in terms of the slowing down of the system?

A Well, the system -- after the breakage, the system would --

Q You are assuming that somehow the flexible shaft --

A Would break.

Q -- gets cut or the gears in the gear box get sheared?

A Right.

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Q What happens inside the sensing unit when that happens?

A All right. The parts in the sensing unit would all slow down, the rotation would be stopped and they would gradually slow down and all the parts would stop. But because no twisting force was set up and a brakage before the cam gear moved, because no twisting force was set up, the cam gear would not have triggered the switch and the unit would stay inoperative.

Q It would stay in the turned-off position?

A Turned-off position, right.

Q All right.

A Now, if the brakes were applied, such as slamming on the brakes, and the anti-skid or the piston force was set up, and the cam gear moved to the right, as we mentioned before -- am I going too fast?

Q Go ahead.

A -- if the cam gear moved to the right and triggered the unit where the solenoid moved back and then the shaft broke, then the governor weights could not continue to expand, they could not expand because the centrifugal force is gone, the force --

Q There is nothing to drive them at that point?

A There is nothing to drive it, that's right.

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Q You just assumed a situation where you got the system turned on and you have now stopped the force coming into it?

A That's right.

Q You stopped its power coming in?

A That's right.

Q By assuming the cut cable?

A That's right.

Q All right.

A Because the cable is cut and because the governor weights can no longer expand the pin that we mentioned here would ride to the rest position because of the force of the spring and the fluid pressure or the braking system's pressure drop as it would at the end of a stop and the hydraulic pressure switch would disengage the entire system.

Q What do you mean by disengaging the system?

A It turns it off.

Q When it turns it off what happens?

A When it turns it off you have your conventional brakes.

Q Do I understand you to be saying that in the event there is a malfunction in the power source coming into the sensing unit the unit contains these features you have told us about, the solenoid and the cam gear and the

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hydraulic switch, that turn the system off and revert it to normal braking?

A That's right.

MR. GRAND: I think that completes the explanation, your Honor. I think we ought to put the witness back on the stand.

THE COURT: All right.

Q Let me show you Plaintiff's Exhibits 9 through 13 and ask you if you can identify these.

A They appear to be the patent, the various patents that have issued relating to the invention.

THE COURT: Take a look at them and make sure what they are.

Q Can you identify these documents?

A Yes. These are the various patents which were allowed during the various stages of development. If we made a modification a patent application would have to be made for that modification. Each of these patents have issued.

Q Are these the patents you referred to yesterday that followed Exhibit 8, which was issued on both the accelerator brake and the original anti-skid?

A Yes.

MR. GRAND: I offer Plaintiff's Exhibits 9

A And discussions with him as to parts, yes.

Q And it was prepared under your direction?

A Yes.

Q And pursuant to your instruction, is that correct?

A That's right.

MR. GRAND: Is that satisfactory, Mr. Benbow?

MR. BENBOW: Thank you, Mr. Grand.

Q Before you began that explanation of the unit I think we were at the point in your story of your meeting the Singer Company or representatives of the Singer Company.

A Yes.

Q I want to go back to that point in time and ask you when you first had contact with anyone from the Singer Company.

A A demonstration of the product was held in Canada and one of the Singer representatives from Canada saw this.

MR. BENBOW: I object, your Honor. I don't think the answer is responsive to the question.

THE COURT: Yes. The question is when.

A I think it was in January, 1964.

Q Was that contact between Perma and the Singer Company between Perma and the Singer Company of the United States or Perma and the Singer Companyy of Canada?

A The first contact was with the Singer Company of

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Canada.

Q When was the first contact with the Singer Company of the United States?

A It was made in February of 1964 or a meeting was held in February.

Q Was the meeting held in February of 1964 preceded by correspondence?

A Yes.

Q Can you identify Plaintiff's Exhibits 14 and 15 for identification?

A Yes.

Q Is Plaintiff's Exhibit 14 --

THE COURT: Why don't you change that around, Mr. Grand, what is Plaintiff's Exhibit 14.

Q What is Plaintiff's Exhibit 14 for identification?

A It was a letter from the Singer Company of Canada to me.

Q It was received when?

A January 21.

Q That's when it was received?

A I am sorry. January 23.

Q What is Plaintiff's Exhibit 15 for identification?

A It's my response to it, sending a letter, at the

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instructions of the January 21 letter, to Mr. Kloby.

Q Who is Mr. Kloby?

A Mr. Kloby was the director of forward planning at the Singer Company.

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Q And he was the director of forward planning at the Singer Company where?

A In Elizabethport, New Jersey.

MR. GRAND: I offer Exhibits 14 and 15 for identification.

THE COURT: Show them to Mr. Benbow. Do you have any objection, Mr. Benbow?

MR. BENBOW: I have none.

THE COURT: Do you have copies of these?

MR. BENBOW: Yes, your Honor.

THE COURT: All right. May I see them, please?

(Plaintiff's Exhibits 14 and 15 for identification received in evidence.)

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(Mr. Grand read from Plaintiff's Exhibit 14 in evidence.)

Q Who is George Mercier, if you know?

A That was the representative in Canada.

Q Of whom?

A Of the Singer Company.

Q Do you know how contact was made between the

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Singer Company of Canada and Perma?

A Yes. A demonstration was put on in Canada by one of our Canadian people that were interested in the product. I don't know if it was -- I think it was a dealer that was going to handle the product or he was -- but anyway, a demonstration was put on up there, and Mr. Mercier witnessed it, and he became interested and came down to Perma to visit us.

Q You say Mercier came to Perma?

A Yes. I may have the name wrong. I may be talking about two different people, but if that's the same person that came down, then it was Mr. Mercier. I think that sounds right, the name.

Q Thereafter, this correspondence took place?

A That's right.

Q That is reflected in Exhibit 14?

A That's right.

(Mr. Grand read from Plaintiff's Exhibit 15 in evidence.)

Q What followed that correspondence?

A In February Mr. Kleby -- some people from the Singer Company came and visited us in response to that letter.

Q Mr. Kleby and who else came?

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A Mr. Kleby, Mr. Morris, who was the manager at the Singer Elizabeth plant, and their chief engineer, I think it was, Mr. Sprague, or their engineer, Mr. Sprague; and I don't know if there was anyone else from Singer.

I think it was just those three.

Q Do you know what the director of forward planning's responsibilities were?

A Yes. We talked about it. I don't remember if he told me before or somewhere that his responsibilities were to look towards Singer's -- what Singer's operations would be in the future, whether they would take on new products to take the place of products which were phasing out, would they bring in new business, things of that type.

Q Tell us what happened during the visit by Mr. Kleby and Mr. Morris and Mr. Sprague? Where did the meeting take place?

A The meeting took place at the Perma office in North Attleboro.

Q In North Attleboro, Massachusetts?

A Yes.

Q Will you tell us as best you recall it what happened on that occasion in February, 1964?

A Mr. Kleby and Mr. Morris expressed an interest in the product based on what they -- the information they got

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from their people in Canada.

We then showed them what the product looked like. We showed them --

Q How did you do that?

A We had drawings of it. We had a movie, an advertising movie on it. We had a demonstrator car.

We had units that we brought in. It was generally done that way.

Q Do you remember the conversation that took place on that occasion?

A Yes, we -- they expressed their interest in the possibility of manufacturing it, and we told them that we had a manufacturer who was financing the entire manufacturing of our product at that time, but that we had been encountering some problems of products not meeting specifications, or adjustments being off, and things of this type, but also that they were on strike.

Q Who was this you were referring to?

A Worcester Stamped Metal. We had placed an order for 50,000 units, as I mentioned yesterday, with Worcester Stamped Metal, and they asked me if I thought -- I don't remember at what stage -- I don't know that this was the first part of the conversation -- they asked me if Worcester Stamped Metal would be interested in selling the manufacturing

rights to them.

I told them that I would discuss this with -- I would continue the discussion, but I would want to talk to Worcester Stamped Metal before it went any further to see if they would be interested in doing that.

Q What if anything was said on the subject of Singer and Singer's quality control or financial resources?

A Well, I expressed to Mr. Kleby that we -- that I thought we might be having a problem going from our pre-production hand-made samples to what would be termed mass production, automatically making the product, automatically making the parts.

And Mr. Kleby gave me a brochure that showed all the quality control and the people and the type of equipment and the things they had that did this very thing, bringing a product from the pre-production stage through mass production by helping on redesign of hardware.

For instance, if you made a part by hand and you made your sample to that, it may not be the best way to mass produce it automatically, and this is what they were experts at doing. In addition --

Q Is that what somebody told you?

A Mr. Kleby was telling me this and showing me the brochure.

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Q Is this the brochure to which you refer, Plaintiff's Exhibit 18 for identification?

A I don't think all the pages are here. There was more than this.

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Q Is that a part of it?

A It's a part of it, yes.

Q Is that the only part that you presently have in your files?

A That's -- yes, that's the -- I don't know where the original is now. It was a -- the original was like a little book.

Q Is thsi the only part that remained to be turned over to your attorneys?

A Yes, evidently.

MR. GRAND: I offer, your Honor, Plaintiff's Exhibit 18. If it is incomplete in any way, and if --

THE COURT: Show it to Mr. Benbow.

MR. GRAND: If Singer has a copy of it that has got more pages I would be delighted to offer the whole thing. This is all we have.

MR. BENBOW: Although I'm sure there is more that could be said, your Honor, we are happy to have this received in evidence.

(Plaintiff's Exhibit 18 was received in evidence.)

MR. GRAND: May I read from it, your Honor?

THE COURT: Yes. Do you have a copy?

MR. GRAND: I have a copy.

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into an arrangement it would have tobe similar to that, it would have to be similar, because I was not interested in a sub-contract, just placing an order, because we couldn't afford to do that, and that I was interested in the Singer Company because I recognized what the Singer Company was, and Worcester Stamped -- we discussed the size of Worcester Stamped Metal and what they could do for me and we compared it, you know.

Q What did you say and what was said at that meeting on the subject of Worcester Stamped Metal?

A Well, Worcester Stamped Metal was a fairly small company and the subject -- we discussed the different --

Q What was said about it, other than your telling us what size it was?

A We were talking about the size of the company relative to what they could do for Perma and the product.

Q Yes?

A And this is when we were discussing the annual report and the size of Singer.

Q And what was said?

A It was said that Singer's size and their engineers and the financial ability would give the product a better chance of success.

Q Was there a demonstration of the device on that

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location?

A Yes.

Q Will you describe it?

A I arranged for the test road that we have to be soaped down, to make it slick.

Q Where was this test road?

A This was done on the Perma property. There was a test track that we had there.

Q What do you mean by a test track? Is that just a strip of road or is it --

A A strip of road which we used to demonstrate the product and to test various components. What they did is they soaped down the road and then wet it down so that it was very slick and then a demonstration -- the car was brought out, a demonstration was put on. We had a switch on the car so that you could turn the unit off and show what would happen if the brakes were applied, slammed on, and a skid was induced, it showed how the car spun around, and then with the unit on how the car stopped straight, and then we offered Mr. Morris, Mr. Kloby and Mr. Sprague a ride in the car and offered to let them try it, which they decided they didn't want to do.

Q Did they witness the demonstration?

A Yes, yes. They were standing there.

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Q Was there anything said about the demonstration after it took place by any of these men?

A Well, I think it was -- I don't remember the exact words, but we walked back in and continued to talk about -- I know they were enchusiastic. I don't remember exactly what words were spoken.

Q You mentioned that a film was shown on that occasion?

A Yes.

MR. GRAND: We have that film here, your Honor. I would like to show it. It's a brief film.

THE COURT: Is it marked?

MR. GRAND: It is marked.

THE COURT: Is that 20-A?

MR. GRAND: I believe it's 20-A, and I believe we have it in the closet in this room behind the court.

THE COURT: Mr. Benbow, do you have any objection to the showing of this film?

MR. BENBOW: No, your Honor, I do not.

(Plaintiff's Exhibit 20-A received in evidence.)

(Film shown.)

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Q Who is Mr. Krawczyk?

A Mr. Krawczyk was the person at Parma that took care of all the paperwork and administrative functions.

(Mr. Grand read from Plaintiff's Exhibit 17 in evidence.)

BY MR. GRAND:

Q What is a sepia?

A A sepia is -- first a blueprint is made up in pencil or a master copy. Then sepias are made from that from which you can make other copies of blueprints, blueprints being the drawings of every part of the unit.

(Mr. Grand read from Plaintiff's Exhibit 17 in evidence.)

Q Did you send the items requested or cause them to be sent to the Singer Company?

A Yes, I did.

Q Specifically did you send down anti-skid units?

A They took one or two units with them at the first meeting, and then the other three were sent on that request.

Q Pardon?

A All the other things were sent to them after

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we got that letter, the units.

Q Did you send a cutaway model of the unit to Singer? That is one of the items requested. That is No. 7 in Exhibit 17.

A If they asked for it I am sure we must have, but I can't be positive.

Q Is it your best recollection that you sent such a unit?

A Yes.

Q Can you identify Exhibit 23 for identification?

A These appear to be the smaller version of the prints that went to the Singer Company of the unit, the blueprints.

Q Is this what you refer to as blueprints or sepias?

A These would be copies of blueprints, yes.

Q But these are shrunken versions?

A That's right.

MR. BENSON: What versions?

MR. GROUD: Shrunken. The miracle of Xerox makes possible the reduction of large papers into smaller size papers. I call them shrunken. I should have said reduced. I am sorry.

I offer Exhibit 23.

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A Yes, I just said that.

Q What was said about changes Singer --

A Well, Singer in looking it over, they were going to evaluate it and get back to further information relating to what changes might take place such as finish or whatever would facilitate mass production.

Q Were there further discussions of this subject?

A At that meeting?

Q You have just testified, I believe, that the people at Singer said they were going to get back to you. I am asking you if there were further discussions on this subject before the June contract.

A Yes. I remember at another meeting we talked about some wear which was occurring on the reverse, which was a bronze washer we were using, and we substituted it -- as a matter of fact, when we were talking and going through the plant, I saw a part they were making for something else and I wanted to know if we could test that part and replace another part with it.

Q Do you remember when that took place? Was that before June or after June or are you not sure?

A I'm not sure.

Q Between the first meeting with Singer in February, and the June contract, did you have any dis-

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discussions on the subject of the experiences in the field with the product that was manufactured at Worcester Stamped Metal?

A Yes.

Q Can you tell us what discussions you had, whom they were with, when they took place?

A Most of my conversations were with Mr. Kloby, and there was another engineer. I don't remember what his name is now.

Q You say another engineer. Was Mr. Kloby an engineer, to your knowledge?

A No, he is not. I mean, another person who is an engineer. I don't know if he was an engineer or not. He was involved in all the engineering meetings.

Q I am now confused. I don't know if --

A You said is Mr. Kloby an engineer and I said I don't know but he was at the engineering meetings.

Q Can you tell us when you had discussions with Mr. Kloby on the subject of field experience, field reports from the Worcester Stamped Metal production and what the subjects of those discussions were?

A From the first meeting that we had in February, right through, and every meeting we had, I was making him aware of the various problems we were encountering. We

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had one problem with a unit we had sent to the General Motors Tech Center and they sent back a letter to me saying we question the reliability of the unit because the fluid is running out of it and I checked it and a fitting was leaking, a fitting had been made improperly.

Q Fitting of what?

A On the front of the Perma-Vac, just a brass fitting where it connects.

Q That is something you discussed with Mr. Kloby?

A Yes.

Q Was there anything else you discussed with Mr. Kloby during this period?

A I told him about two experiences we had with the United States Postal Department where we had a gear box, hydraulic pressure switch failure.

Q Do you remember which it was, a gear box or --

A We had one on one truck and one on another, and I remember I went down myself, so I know what it was. One was a gear box, that failed, it was making a noise, and we took it off the vehicle, and another was a pressure switch that was leaking. The pressure switch is made so the fluid won't come out of it but the driver brought it to someone's attention and we took it off the car, examined it and found out the finish inside the hydraulic switch was bad, and it

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was leaking. I brought this to Mr. Kloby's attention. We had some correspondence related to these things. I think you have letters.

Q Were there any other pressure switch problems you brought to Mr. Kloby's attention during this period?

A Yes. We took apart some pressure switches, after that experience, and we found some of the O rings were cut during the assembly.

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MR. BENBOW: Can I inquire what time period this is?

THE COURT: When you had these conversations with Mr. Kloby during what period of time was it?

THE WITNESS: From the first meeting we had right up to May and June.

THE COURT: The O rings are two small devices which are shown on your drawing over there, Plaintiff's Exhibit No. 5.

BY MR. GRAND:

Q Am I pointing to the one place where there are O rings in this invention, namely, on the piston in the hydraulic fluid chamber?

A This is thue O ring we are talking about (indicating).

Q You are talking about another O ring, represented by a black line in the hydraulic switch?

A Yes.

Q Are you referring to an O ring which is represented by the black line that I am pointing to in the hydraulic pressure switch?

A Yes.

Q And that is a rubber doughnut-shaped seal?

A Yes, it is a seal that keeps the fluid in the

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system.

THE COURT: Is this also called a washer?

MR. GRAND: Thank you, your Honor.

THE WITNESS: A lot of these parts are called different things, your Honor.

MR. BENBOW: Did he answer yes?

THE COURT: He said they are called different things. I guess it depends what part of the country you come from. Go ahead.

MR. GRAND: I want to offer this, your Honor, as Exhibit 24.

THE COURT: Mr. Benbow, have you seen it?

MR. BENBOW: I have just looked at it, your Honor, and I have no objection.

(Plaintiff's Exhibit 24 was received in evidence.)

MR. BENBOW: Incidentally, I was wrong about the previous exhibit, when I said it was yr. It apparently is yr., for year.

THE COURT: You know, one of the blessings of having Xerox around and the other copying machines -- I don't know if Singer makes one; I don't want to insult them -- but the blessing is everybody gets a copy, and the problem is everyone gets eye strain.

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Here you go, Mr. Grand.

MR. GRAND: Thank you, your Honor.

This document, mechanical engineering division, dated May 22, 1964, captioned "Anti-skid Device," and on the third page it says:

"The following items were discussed as areas which should be checked but are not included in the test procedure at this time: 1. Check for possible leaking of fluid of the O ring."

Then there are dimensions on my copy. I don't know who wrote those.

MR. BENBOW: Yes, in hand.

MR. GRAND: This is a document from the files of the Singer Company, is that correct, Mr. Benbow?

MR. BENBOW: I believe so, yes.

BY MR. GRAND:

Q What are the consequences, Mr. Perrino, of the leaking of fluid past the O ring in the pressure switch?

A Loss of brake fluid and eventually the possibility of loss of brakes.

Q Were there other items that were discussed with Mr. Kloby prior to the June contract on the subject of problems that you were learning about as a result of

the production by Worcester Stamped Metal?

A The unit they put on their car, the Perma-Vac has an elbow, a tube --

Q The unit they put on their car, I don't think we know what you are talking about.

A The unit we gave Singer initially, one was put on their car and the tube broke off.

Q I have in my hand Exhibit 2. You have referred to an elbow. Is the metal, brass-colored tube coming out --

A Yes, that is called an elbow. The original drawings, or maybe someone failed to bring other drawings, called for silver solder ring, and in production at Worcester Metal it was just soft solder, which is not strong enough, and during assembling the unit broke off. This was certainly discussed with them.

Another one was substituted and -- I don't remember what the drawing said but they agreed those should be silver soldered or brazed, which is a stronger way of attaching it. That's what was done with the units.

Q Was there any discussion during this period as to pressure switch settings?

A Yes.

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Q Will you tell me what that was and when they took place?

A All those switches should have been checked on a test stand so everyone closes and opens at a certain pressure. If you are not careful you can turn the screw too much or not enough and you will end up with a setting other than what it was supposed to be.

Q What is the consequence of an improper setting of the pressure switch?

A If the setting is too high then the car will not prevent a skid on slippery surfaces because the pressure switch is off too early. If it is set too low you will get a longer stopping distance, only at the extreme end of the stop.

Q On every surface?

A Particularly on dry surfaces.

Q During this period, that is, prior to the June contract, was there any discussion concerning a man named Lande?

A Yes.

Q Can you tell me what those circumstances were and what took place?

A Singer Elizabeth, they call it, I was with Mr. Kloby at a meeting and he said he just received a

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telephone call from Ohio and he said --

Q Kloby told you you had a telephone call --

A I got on the telephone and I talked to Lands.

Q Then what did you do?

A Then I went back into the meeting.

Q Who was at this meeting?

A Mr. Kloby and Mr. Morris and I think someone else was there, I'm not sure. I told them --

MR. BEHROW: This sounds like hearsay recitation. I don't know who he is referring to. If he is purporting to give you a conversation he had --

THE COURT: You had a conversation on the telephone. Don't tell us what it was. After you had the conversation you went back to see Mr. Morris and Mr. Kloby and whoever was there, is that correct?

THE WITNESS: That's right, your Honor.

THE COURT: Tell us what you said to them and what they said to you.

THE WITNESS: I told Mr. Kloby that the unit had --

BY MR. GRAND:

Q What unit?

A The sensing unit in one of the installations in Ohio, the sensing unit had worn out and --

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MR. BENBOW: I object to the continuing of the answer, your Honor. He is reporting something that was said to him that he is not clearly attributing to the source from which it comes.

THE COURT: I will tell you what. There is a great story about a guy buying a book. He said, "I have to call my office," and he went outside all the time and pretended to make a phone call, and of course he heard the weather many times and of course he told the seller of the book that the price had gone up a little bit and he couldn't go any further, and then he called for the weather report and came back again and naturally a bargain struck. What happened between the two parties is fact as far as I am concerned. The weather report I couldn't care less about.

Here we have a conversation between this witness and Mr. Kloby. I am interested in that. What Mr. Lande might have told the witness is as useful to us as the weather report.

MR. BENBOW: I agree, your Honor. But the way he was phrasing himself, if the record is read back it would make it sound as if he knew --

MR. GRAND: You stopped him. He wants to --

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MR. BENDOW: When I objected --

THE COURT: You said to Mr. Kloby what?

THE WITNESS: I told Mr. Kloby we had a failure in Ohio and I described what was described to me by Mr. Lande.

BY MR. GRAND:

Q What did you say to the people in the meeting where you were?

A I described what I thought I heard and that was a premature wearing out of the governor housing, which is the plastic part in the unit, and a destruction of the solenoid and a reduction in brake pressure when the car was practically stopped. It was a loss of brakes which I was very concerned about, destruction in the unit which I was upset about, and I brought it to his attention and I immediately asked for the unit to come in so that I could discuss it with the Singer people.

Q What was said at that meeting about remedying that situation, if anything?

A When I got the unit --

THE COURT: We are interested in the meeting.

A No one knew what to do about it because no one knew what caused it. I said that I would get back

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to them as soon as I knew what happened to the unit.

Q Did you?

A Yes.

Q To whom did you get back?

A To Mr. Kloby again.

Q What did you tell him?

A I told him from analyzing the unit what I thought had happened to it, and on the governor spool, which is the piece that the solenoid plunger rides against, the automatic tooling which was supposed to cut it across and make it smooth left a little hill, like the end of a pencil, and this caught the end of the plastic and everything just ran out and burnt up.

Q What did you and Kloby say about that, if anything?

A It was clear what had happened. The parts --

THE COURT: We don't want to know what is clear. What was said?

THE WITNESS: Well, Kloby called Mr. Larrouse I think -- we went to the quality control people and we talked about the finisher on the governor spool.

Q Where in point of time are you?

A I'm before June because we were working with them prior to the contract. We were working with them

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setting up test batches assuming we would go forward with the contract.

Q When was the contract entered into?

A It was signed in June but this was before June.

Q Do you recall any other conversations on this subject of problems that were encountered with the units produced by Worcester Stamped Metal prior to the June contract?

A I don't remember any more at the present time.

Q Let me show you Exhibit 21 for identification. Can you identify that document?

A This is a report I got back from Mr. Wing of Cadillac, General Motors. It's a report of some test runs they made -- I don't remember if it was a car we sent down there or a unit they put on their car. It was as a result of that test.

Q When did you receive this document?

A Some time in early '64.

Q You say it is as a result of some tests. Are these stopping distance tests?

A Stopping distance comparison, it says. I thought they were running for control too.

Q You say you received it in early '64. What did you do with it?

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MR. GRAND: Let me simply state that this document is dated the 1st day of January, 1965.

xx (Plaintiff's Exhibit 34 received in evidence.)

THE COURT: It is dated as of the 1st day of January.

MR. GRAND: Did I miss that?

THE COURT: Yes.

MR.GRAND: I'm sorry.

THE COURT: I was just wondering whether anyone would be working on New Year's Day.

MR. GRAND: Oh, of course.

MR.BENBOW: The Singer Company is very diligent, your Honor.

MR. GRAND: The Singer Company of Canada.

BY MR. GRAND:

Q Just to put us back in focus, Mr. Perrino, I want to talk in examining you now about the experience under the June 18th contract between Singer and Perma, that is, the contract dated June 18, 1964.

To your knowledge, was product shipped under that contract to distributors or customers?

A Yes, product was shipped.

Q Can you tell us approximately how many Perma

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anti-skid controls?

A I believe it was approximately 2000 units. I'm not positive that's an exact number.

Q During the period of the June contract, that is, from June to December, 1964, were there problems encountered with the product?

A Yes, there were.

Q Were there meetings between representatives of Perma and Singer relating to those problems?

A Yes, there were.

Q And did you personally attend a number of these meetings?

A Yes, I did.

Q And did you personally inspect units, anti-skid controls that were being produced?

A Yes, I did.

Q Can you tell us initially --

MR. BENBOW: I object to the word "produced."

MR. GRAND: Manufactured? Is there any --

MR. BENBOW: I would prefer the word "assembled," which I think is more accurate.

THE COURT: All right, let us consider it assembled.

A Yes, I inspected the product that was assembled

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confining my question to those 2000 units -- were there problems encountered with units that were either being assembled or manufactured or produced, whatever word we want to use?

MR. BENBOW: Well, I don't accept that, your Honor. I made specific objection to the use of the word "manufactured" or "produced."

MR. GRAND: I am confused by that, since the contract calls on Singer to manufacture, so --

THE COURT: Produced is about the most harmless word we can have here. Why don't we let it go as produced. The objection is overruled.

A As a result of some --

Q The only question is, were there problems?

A Yes, there were problems and we did go to inspect some units.

Q And I am not confining my question to the 2000 units you said were shipped.

A No. We inspected -- there was an inventory there of which the 2000 came out of, so we went down to inspect sample units out of various lots to see what the defects were.

Q And this was at various times between June and December?

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A That's right.

Q Can you initially tell me what parts of the unit you discovered on the inspection had problems?

A We found leaky pressure switches as one of the problems.

Q At the moment I am just asking you what components.

A Pressure switch was one of the problems. The micro-switch, which is the --

Q That is part of the sensing unit, isn't it?

A The sensing unit had some --

Q Perhaps I should do it another way.

You said there were problems with the sensing switch?

A Yes.

Q There were problems with the gear box?

A Yes.

Q Were there problems with the check valve?

A Yes.

Q Now I would like to start with the check valve and perhaps we should get the diagram out again.

MR. BENBOW: Your Honor, while Mr. Grand is doing that, I want to make clear the reason for my objection to the word "produced" which perhaps is not clear on the

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50,000 total. I'm not sure.

MR. BENBOW: And in any case, only 2000 were shipped during this period?

THE WITNESS: To the best of my belief, yes.

MR. BENBOW: All of which could have been shipped out of the original 5000 received?

THE WITNESS: I don't know which ones were shipped out.

Q The problems that you have testified -- let me withdraw that.

We were about to discuss specific problems that were encountered with various components of the invention between June and December, 1964.

When you described these problems, are you referring to problems that existed in the entire 50,000?

A Yes, I am.

Q Now I would like to begin with a problem connected with the check valve.

A Yes.

Q Why don't you come out and point out the check valve on the diagram.

THE COURT: What exhibit is that, Mr. Grand?

MR. GRAND: Exhibit 5.

Thank you, your Honor.

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THE COURT: Go ahead, point out the check valve.

A The check valve is in the front of the hydraulic fluidchamber.

THE COURT: Turn around and do it the other way so the jury can see it.

THE WITNESS: The check valve is in front of the hydraulic fluid chamber.

THE COURT: All right. Can you take this pen and put a little line and mark the check valve. Write the words "Check Valve" and put an arrow as to where it is.

(Witness complies.)

Q Would you tell us the function of the check valve?

A The check valve prevents the operator of the car from continuing to allow -- push fluid into the system when the anti-skid is trying to function or attempting to function to remove it.

Q Can you tell me what problem you discovered in the check valve during the period of the June contract?

A When the check valve was assembled or produced in mass production, the seat on which the valve closes off the hole was rough, jagged, so that the valve would not seat completely.

Q What was the consequence of that?

A In operation of --

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Q Yes.

A The anti-skid may not function in some instances, particularly on slippery surfaces.

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Q What is the cause of that rough finish or the check valve not being able to seat properly?

A Well, in mass production they have tooling, automatic machines, and the machines make this piece with cutting tools, and after a while the tool would get dull and this may occur. Then it has to be resharpened again. I know between some of this production you would get good pieces and then you would ultimately get some bad ones and then you would get good ones, unless they were inspected and rejected.

Q In the building of the preproduction samples that you testified about the other day was this problem encountered?

A No. These were handmade and the finish was checked on each piece.

Q Were there also problems encountered during this period with the gear box?

A Yes.

Q That is, between June and December?

A Yes.

Q And the gear box is the component I am pointing to labeled "Gear Box" on Exhibit 5?

A Yes.

Q Can you tell me what problems were encountered

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with the gear box during this period?

A There was premature wear in the gears.

Q Can you tell me what the cause of that problem was?

A The cause was our specifications were improper, Perma's specifications were improper.

Q Are you saying that Perma gave written specifications to Singer for the manufacture of the gear box and those specifications were inaccurate or wrong in some way?

A Yes, I am.

Now --

Q Do I understand that the gear box was then made to those specifications and then did not function correctly?

A Can I explain what happened?

Q Answer my question first.

A That's right.

Q Did that occur with the preproduction samples?

A No, it did not.

Q Can you tell us why not?

A Because when the preproduction -- when the gear box was designed the specifications were made to a sample. The sample had premature wear and then the

drawing, which Mr. Wiley had, was corrected, evidently, and the preproduction samples were made to that correction. But the correction never was transferred to the master copy or the original copy and when I submitted the blueprints to Worcester Stamped Metal the correction was not put there and the product was made to the specifications, not to the one the way it was made in the preproduction sample.

Q Can you tell us what problems were encountered with the pressure switch during this period? The pressure switch, am I correct, is the component that I am pointing to on Exhibit 5 labeled "Hydraulic Pressure Switch"?

A Yes. The hydraulic pressure switch had a number of things wrong. One was -- we are talking about the period of the inspection between June and December, we are still in that period?

Q That's right.

A Yes.

Q Let me go back for a minute. Where did you conduct the inspections that you are now testifying about?

A Singer, at the Singer plant.

Q Periodically during the June contract would you

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go down to Singer?

A Yes, we were there quite frequently.

Q Tell us what specific problems were encountered with this hydraulic pressure switch.

A The finish on the cylinder in which the piston is inserted was bad. This meant where the O rings -- the wall that the O rings slid up and down on had a bad finish. This was due to the same reason that the check valve was. A shop tool makes a nice smooth finish and then as the tool dullens the finish can become poor, and this is what happened there.

In addition to that, there is -- when the O ring, which is larger than the piston -- it must be compressed and inserted in the cylinder -- when the O ring is inserted it has to have a cut, a funnel on the the top of it cut into the steel. The top has an angle and then it goes straight down, so that the rubber will be compressed and then put in the cylinder, and the angle or ~~than~~ the chamfer in some cases was not even in the unit.

Q You say thatchamfer. What is a chamfer?

A The chamfer is the funnel effect that is cut into the steel. On some units it was not there, on other units it was not enough, and on other units it had

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sharp edges, and some, of course, were okay.

Q What was happening to the O rings during the assembly process?

A The O rings would be cut during assembly and this would cause a fluid leak.

Q With what consequence?

A If it was put in an automobile fuild would be lost and you could lose brakes.

Q What steps, if any, during this period were taken to remedy this problem?

MR. BERROW: Objection. Taken by whom?

Q You can certainly answer who took the steps.

THE COURT: Were any steps taken? Yes or no.

THE WITNESS: Yes.

THE COURT: Who took the steps?

THE WITNESS: A meeting between Perma and Singer --

THE COURT: No, no. Answer me. Who took the steps?

THE WITNESS: We both did, your Honor.

THE COURT: All right. What steps were taken, and then tell us how it came about?

THE WITNESS: A meeting took place as a result

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of that switch problem and we both discussed the consequences of this and we changed the angle or that funnel effect so it was wider and Singer agreed to contact the supplier to make sure that this would not occur again, the finish, the funnel effect, and they were using inferior O rings as well.

Q You said "they." Who is "they"?

A The supplier.

Q What is the name of the supplier?

A U. S. Dielectric.

Q Was the increase in the size of the funnel a step taken to facilitate mass production?

A Yes. It had nothing to do with operation. Once the seal was inserted beyond the funnel it did not go back into that funnel portion of the unit, it functioned below that. It was merely to assemble.

Q Did this kind of problem, the cutting of the O rings in assembly, happen in connection with the pre-production samples?

A No, it did not.

Q Tell us why not.

A Because we were assembling a small amount of these units by hand and each unit was assembled and lubricated so that we just did not -- this did not occur.

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It was done when it was done in an assembly line with a lot of them being assembled one after the other.

Q Can you tell me what problems -- and at the moment I just want a list of the problems, if you recall them -- were encountered in this period June to December with the sensing unit?

A There were several in the sensing unit. You want me to --

THE COURT: Just a list of them.

A The micro switch setting, which was the triggering mechanism, was set improperly.

The governor spool face, which is the part that the solenoid plunger touches against, had a finish on it and had plating peeling off it.

In some cases -- in the back of the unit where the switch is there is a spring that we talked about. Sometime the spring was not tightened, sometime there were two springs accidentally put on.

THE COURT: All right. Point out exactly where you are talking about. The back of the unit you said. Tell us exactly where. Point it out.

THE WITNESS: The spring that causes the resistance we talked about before so that the cam gear will activate the switch, that spring has to have

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a certain tension. So sometime there was only one --

Q How many should be there?

A I mean, sometime there is one, which there should be, sometime there was one which was not tightened, and other times there was two, one on top of the other.

Q What problems --

A The finish on the governor spool where the solenoid armature touches against, sometime that finish was poor and sometimes the plating -- it was plated, but the plating would be peeling off, a chrome plating.

Q Do you recall other problems that you noted?

A Yes. There were pins. Sometimes the pins were left completely out. Sometimes the pins that are used on the cam gear or to assemble the unit were completely left out.

Q Were there any other parts that were missing.

A The rotary valve in some cases had a bad finish where they would bind before even being used.

There were some cases where there was misalignment of the cover in assembly and some cases where the wires were not soldered propertly to the switches.

Q Can you tell us what you mean by the word "bind."

A Bind is where the rotary valve could not turn freely in its housing because of -- because there would

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be scrape or score marks on it from the tooling, the tooling that made it.

Q Do you recall any other problems that you discovered or encountered with the sensing unit?

A I don't recall any others.

THE COURT: Would this be a good time to take our morning break?

MR. GRAND: Itmight be, your Honor. This is a somewhat lengthy document.

THE COURT: Ladies and gentlemen, we will take our break.

(Recess.)

MR. GRAND: Your Honor, during the recess defense counsel pointed out that there were a number of underlinings on Exhibit 38 as well as its being illegible in some parts and they were good enough to furnish us with clean copies of the same documents. So that the record will be complete, I suggest that those three documents in the same order be marked as Plaintiff's Exhibit 38A.

THE COURT: Mr. Benbow, do you have any objection to the receipt in evidence of Exhibit 38A?

MR. BENBOW: No, your Honor.

(Plaintiff's Exhibit 38A was received in evi-

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dence.)

MR. GRAND: These are three memoranda prepared by the Singer Company of meetings --

MR. BENBOW: Shouldn't you have the witness perhaps identify the document?

MR. GRAND: It's a Singer document. I think I can in this instance.

BY MR. GRAND:

Q Can you identify the three memoranda that comprise Exhibit 38A, Mr. Perrino?

A These are copies which we received from Singer after we had a meeting.

Q A meeting or meetings?

A Meetings.

Q Look at the documents before you talk about them.

A These documents were given me by Singer after -- each document would be given to me after each meeting or mailed to me.

Q Let me see if I can clarify. Are these documents that comprise Exhibit 38A memoranda prepared by Singer of three separate meetings, one on September 2nd, one on September 3rd and one on September 8, 1964?

A Yes, they are.

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MR. GRAND: May I read portions of these memoranda, your Honor?

THE COURT: Yes.

MR. GRAND: The first memorandum, which is dated September 2, 1964, andentitled Meeting Between Perma And Singer Personnel and various people are listed, states in the first paragraph:

"This meeting was held to determine all problems which are preventing the production of satisfactory anti-skid units."

On the next page --

MR. BENSON: Mr. Grand, couldn't we have it identified who was present at this meeting?

MR. GRAND: I am happy to do that if you think that it is important.

THE COURT: Go ahead.

MR. GRAND: The people present are Messrs. F. Di Benedetto, R. Mainelli, H. Snyder, Jr., A. Romel, R.R. Patton, J.F. Moore, E. Kinal and H. Sharp.

On the second page of the first memorandum under a caption numbered 3, defective parts, pressure switch, it reads:

"Excessive leaking through the pressure setting caused the examination of several disassembled

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switches. This disclosed that the piston O ring was being cut due to a sharp edge on the I.D. of the piston hole."

Q What does I.D. mean?

A Inside diameter.

MR. GRAND: "This defect is very serious and could cause a brake failure," I think is the word on my copy.

MR. BENBOW: Yes.

MR. GRAND: "This defect was brought to the attention of U.S. Dielectric and they promised to correct this situation."

THE COURT: "This condition."

MR. GRAND: I really shouldn't be this tired this early in the morning. "This condition."

MR. BENBOW: Mr. Grand, take the exhibit and I think I will try to follow. It is easier to follow than to read.

MR. GRAND: The problem is I have it marked off.

MR. BENBOW: We will try to keep up.

MR. GRAND: "Inspection of the O rings which they are presently using have a heavy flash on the O.D."

Q What is the O.D.?

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A The outside diameter. Flashing is -- do you want me to explain what flashing in?

Q Sure.

A A flashing is when the mold makes the O ring, where the mold parts, it leaves rubber sticking out if it is not proper.

Q Rough edges?

A Rough edges, yes.

MR. GRAND: "Inspection of the O rings which they are presently using have a heavy flash on the O.D. and I.D. In the future they agreed to use Conover O rings which are of a better quality."

In paragraph 4 labeled Sensing Units, it says:

"16 sensing units were dissembled by Perma personnel and the timing of the micro-switch was found to be off on two units.

"One unit had a bent gear shaft pin and a friction spring which was not centralized on the cam washer.

"Another unit had a poor bearing on the cam gear thrust washer.

"A loose wire due to faulty soldering was found and also there was no oil on the gear shaft."

Then under paragraph 5 on the next page labeled

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Gear Boxes, it reads:

"Perma informed us that after a life test was run on American Optical gear boxes, they find that they do not hold up as well as the gear boxes produced by Swank.

"The prints of the gear boxes and also a comparison chart between American Optical tolerances and Swank tolerances have been given to Mr. E. Kinal of quality control on September 4th. Mr. G. Moore called American Optical and told them to halt production of gear boxes until further notice. Singer will make a dimensional check on gear boxes purchased from American Optical to determine if they meet print specifications. If the parts are to print and additional research and production testing is required to find a solution to this problem, Perma has agreed to work out a financial arrangement with Singer for this work."

The next memorandum in this exhibit, which is dated September 3, 1964, the subject of the memorandum is meeting between Perma, American Optical and Singer personnel, and has in attendance F. Perrino, R. Mainelli, J.R. Vairo, R. Lee, E. Kuzdzal, N. Lapine, H. Snyder, Jr., R.R. Patten, A. Romel, H. Sharp, E. Kinal, J.F. Moore and

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F. Kloby.

This memorandum reads, beginning with the above personnel present:

"15 units were disassembled and the following defects were found:"

I am going to read simply a few of them.

"1. Gear shaft not central, one part very bad and two units questionable. American Optical agreed that one part was very bad and could cause excessive wear. This condition was brought to American Optical's attention previously by Perma."

On the next page under Item 6, setting on micro-switch:

"Two parts had high setting of 3-1/4 to 3-3/8 inside of specification 2-3.

"American Optical was notified to halt production of sensing units until the above problems were ironed out and an acceptable quality level was established.

"Perma has a check list of 25 characteristics which they feel is necessary to insure quality of sensing devices. Several more characteristics are being added to this list by Singer.

"These items were given to American Optical by Perma verbally. Singer will formalize these checks

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as an assembly specification.

"Mr. F. Perrino of Perma is particularly concerned about the governor spool plating, the microswitch settings and proper positioning of the thrust washer; and that the solenoid meets all assembly specifications."

The next memorandum, the third one, which is dated September 8, 1964, the subject of which is Meeting Between Perma, Singer and American Optical Personnel, shows in attendance F. Di Benedetto of Perma, R. Mainelli (Perma), N. Lapine, Sr. (American Optical), R.E. Lee (American Optical), E. Kinal (Singer), J.W. Casner (Singer), H. Sharp (Singer).

This memorandum reads in part:

"This meeting was had to determine the quality level present in the anti-skid unit sensing device. This quality analysis was instituted as a result of the findings between Perma, American Optical and Singer personnel September 3, 1964.

"A random sampling of various dated shipments from American Optical was employed to obtain sensing devices for testing. These sensing devices, which totaled 100, were all checked and the findings approved by the parties attending.

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"The sample sensing devices were obtained from the shipments as follows:

"Date of shipment, 7/7/64, 7/20/64, 7/24/64, 8/24/64 and 9/1/64."

In other words, from July to September.

There are then additional columns showing the total amount of the shipment ranging in the first column, the first one of July 7, 1964, being 3015, July 20, 1964, being 3015, July 24, 1964, being the same number, August 24, 1964, shipment 7284, the September 1 shipment 3510.

The next column indicates the units randomly selected from each of these shipments and they are 17, 17, 17, 34 and 17.

Then the units from each carton in shipment and there are four in each.

Then it goes on to read:

"The component parts were checked visually and electrically according to the quality control check list of the anti-skid unit. This check list was drawn up by Perma of which all three parties received a copy at the September 8th meeting."

Then the results appear --

MR. BENBOW: September 8, 1964, meeting, right?

MR. GRAND: Thank you.

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Then the next few pages list the results. The first are those pages, page 3, under Results of Tests 9/8/64, microswitch settings on July 7, 1964, shipment, some of the remarks are as follows:

"Cam retaining spring not centralized over cam gear button."

I will omit the part numbers.

Another is:

"No clearance between governor shaft spool and Delrin governor housing."

Another is:

"Switch stays closed with solenoid assembly."

Another is:

"Pin missing from governor housing."

Another is:

"Bent leaf spring. Centrality of gear shaft and gear train cover."

Another underneath that:

"Switch stays closed with solenoid assembled."

On the next page, this being the July 20, 1964, shipment:

"No clearance between governor shaft spool and Delrin governor housing."

Another is:

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"Delrin button cocked in gear."

Another is, skipping one:

"Cam washer shaft pin in backwards."

Below that:

"Section spring retaining pin missing. Thrust washer was not on reverse switch cam."

Below that:

"Cam washer shaft pin put in backwards."

Both on this page and the previous page appears a column entitled Vacuum Bind, and with respect to some of the items inspected you find the word "Yes," indicating that some of the units indicated a vacuum bind as well.

On the July 24th shipment, which is page 5, some of the comments are:

"Microswitch will not open with solenoid assembled. Centrality of gear shaft and gear train cover."

Another is:

"No clearance between governor shaft spool and Delrin valve housing."

On the August 24th shipment on page 6, one of the comments in the middle of the page is:

"Reverse cam thrust washer was not aligned betweenpins."

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Another, skipping one, is:

"Bearing surface chopped up on thrust washer busding."

Another at the bottom of the page is:

"Reverse switch wire contact not soldered properly."

Continuing now on page 7:

"Reverse switch contact wire not soldered properly.

"Reverse cam thrust washer guide pin busted.

"Governor shaft washer too thin."

Finally:

"No clearance between governor shaft and Delrin valve housing."

Also there is an indication of vacuum bind on one of the units checked on that occasion as well from that shipment.

On the September 1, 1964, shipment, the commants are:

"Governor shaft binds," apparently on unit No. 10, and there it reads:

"Governor shaft binds," and "Yes" under vacuum bind.

No. 11 reads:

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"Hesitates to go off with solenoid assembled," and also "Yes" under vacuum bind.

Then it states on the next page in the last paragraph:

"The findings of this quality control check are to be evaluated by Perma, American Optical and Singer and their conclusions presented at the meeting arranged for this purpose September 14, 1964."

BY MR. GRAND:

Q Can you tell me, Mr. Perrino, what vacuum bind is?

A Yes. By vacuum bind we meant that when we took one of these units that we suspected the rotary valve may not be made with the proper finish on it or if we had a scald mark on it we would put it on the test stand and then we try to turn it and it wouldn't turn, it would be bound up.

Q And the consequence of that would be what?

A Inoperative anti-skid unit device.

Q Can you tell me what problem, if any, was encountered between June and December, 1964, with respect to the cam gear?

A The cam gear -- we talked about this --

Q Point to it on Exhibit 5.

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A It's right here on the back of the anti-skid unit (indicating).

Q It is the item, interesting enough, labeled "cam unit," correct?

A Right.

Q To which the drive gear is attached?

A Yes.

We mentioned before that the cam gear must ride up and down on a pin, on a rotary motion on a pin. If the gear had a ragged edge because it came out of the mold with a bad edge on it, which we call flashing, also, then the pin used to get caught in the ragged edge and it wouldn't operate properly."

Q Why don't you sit down again. I think you anticipated my question a little bit.

Tell me what was the problem that was encountered with the cam gear in the period between June and December, 1964.

A That during mass assembly or mass production in the mold, sometimes the mold would part or dirt might have been on it and a flashing would have been left there and the gear would be assembled in the unit that way.

Q Did this occur with the pre-production samples?

A No, because each one, again, was made by hand

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and polished.

Q Was the problem as you have described with the cam gear the subject of discussions between you and anyone at Singer?

A Yes. I discussed it with Mr. Romel and with Mr. Kloby.

Q Do you know when and do you remember what the conversations were?

A We talked about ways of resolving the problem and this was in the period between June and September, October, in that area.

THE COURT: Keep your voice up now, please.

A Between the period of June and October or September or October. We talked about the flashing and we talked about ways of resolving it, and it was decided by knocking that flashing off, cutting it off, and polishing it so that it would be the same as the pre-production samples that this would not occur.

In addition to that, we also talked that during mass assembly that it's possible that this could keep re-occurring and we tried to make provisions to facilitate mass production, such as making the angle greater. We also talked about not making that angle go so far.

We were trying to eliminate the possibility of

this happening while they were being made in large numbers.

Q Can you tell me what steps were agreed upon at the time you were having discussions with Mr. Romel and Mr. Kloby?

A Yes. We took two steps. One was to polish the gear and the other was to not make the hill so long. We polished the edge where the pin would ride.

The other --

Q There is no question.

MR. GRAND: I offer Plaintiff's Exhibit 49.

THE COURT: Mr. Benbow, do you have Plaintiff's Exhibit 49?

MR. BENBOW: Yes, I do, your Honor.

THE COURT: Have you seen it?

MR. BENBOW: I have seen it. It is a document prepared by Mr. Romel. No objection.

THE COURT: I am sure you have a copy. I want you to take a look at the one --

MR. BENBOW: I did. I saw it.

Thank you, your Honor, I appreciate it.

(Plaintiff's Exhibit 49 received in evidence.)

MR. GRAND: Exhibit 49 is a memorandum fr[illegible] Mr. Romel to Mr. Broeker, assistant general manager,

Manufacturing Division, on Singer letterhead, dated September 28, 1964, entitled under Subject: Status Report - Perma.

On the second page under the letter B, cam gear, it reads as follows:

"1. Polish only - proved 50 per cent reliable on our test stand.

"2. Cut down override only. Two gears tested at 40 mph stop failed to return immediately. At 80 mph, both functioned properly.

"3. Cut down override and polish to 20-22 rms - no failures in five gears tested at 40 mph, stop test."

Q What does rms mean?

A Rms is the smoothness.

Q Do you know what the initials stand for, the letters stand?

A No. Rms just means the type of finish on a piece of metal.

MR. GRAND: "4. Increased helix angle - no samples available for testing."

Q What is the helix angle on the cam gear?

A It means the angle from flat. In other words, the amount of this angle (indicating).

Q Is that the angle you referred to as the incline

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or the hill?

A Yes.

MR. GRAND: It goes on to read:

"The above tests indicate that cam gear in Item 3," that was the item that said cut down override and polish to 20-22rms," are reliable and, therefore, the mold will be changed. The new print now specifies the 32 rms finish polished to 20 rms. An ultimate design with a larger helix angle will be pursued to eliminate the variables that are inherent in the polishing operation. Mr. Perrino agreed that this would be done at some future date but could not be done immediately in that this change affects other parts. Calculations for new switch settings and other changes will be looked into."

Q Now, what was said, if you recall, between you and Mr. Romel on the subject of changing the helix angle or the angle of the hill?

A Mr. Romel told me that he wasn't sure that on the automatic machines or mass production that that smoothness could be held all the time.

Q What smoothness?

A The finish on the angle, and that it would be too costly to polish them all, and he wanted to know if

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we could resolve it some other way. We talked about changing the angle so it would have a steeper hill and, therefore, it could slide down easier, but just changing the hill or the angle and putting it back in wasn't the answer because it would affect other things, like the spring and the action of this sort. You had to take into consideration what other effects it had in the unit and until you did you just couldn't make that change then.

Q Was that change pursued at that time, that is, were steps taken to modify or change the helix angle at that point in time?

A No.

Q At that point in time, being the date of the memorandum, which is September 28, 1964?

A No, no, they were not, because Mr. Romel ran some tests and he indicated a hundred per cent reliability on the other two steps.

Q Was there any conversation about doing something concerning the helix angle in the future?

A Yes, there was.

Q And what was that?

A Singer, Mr. Romel said that he was going to work on the helix angle and get in touch with me, we were going to sit down with engineering, but I don't remember

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going any further on it.

Q I don't hear you.

A We were to sit down with engineering at Singer and go over that, but I don't remember going any further on that point.

Q Did this problem of flashing or cam gear hang-up occur with the pre-production samples?

MR. BENBOW: Objection. No reference has been made that I heard to cam gear hang-up.

MR. GRAND: I am sorry.

Q Did this problem --

THE COURT: Refrase it.

Q -- of flashing or rough edge on the cam gear occur on the pre-production samples?

A No, it did not.

Q Mr. Perrino, you testified that a changing of the helix or the incline angle would affect other parts of the unit.

What effect would a change in the helix angle have on the operation of the unit?

A -- Well, the helix angle that was in the unit that we are talking about was -- well, that angle along with the spring tension behind it determined when the unit would be triggered, when it would be turned on, what

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amount of locking up wheels, and if you just changed that helix along, it would react differently because it would have a steeper hill and the same tension spring, so it would go on -- it wouldn't trigger soon enough.

Q So that before you change one you have to consider changes to the others?

A That's right. That's right.

MR. GRAND: I offer Plaintiff's Exhibits 39 and 47 for identification.

MR. BENBOW: I have no objection, your Honor.

THE COURT: All right. Exhibits 39 and 47 received.

(Plaintiff's Exhibits 39 and 47 received in evidence.)

MR. GRAND: Exhibit 47 is entitled Minutes of Meeting of September 24, 1964, subject: Perman Anti-Skid Unit.

In attendance, Messrs. C.W. Broeker, J. Packo, J. Larrousse, J. Moore, N. Hnojowy, R. Patten, H. Snyder,Jr., R. Kloby and R. Romel.

Q Can you tell me who Mr. Broeker is?

A Mr. Broeker, I believe, was in charge of manufacturing and Mr. Romel's boss.

Q At?

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A At Elizabethport.

Q Are all of the persons whose names I just read as being in attendance at this meeting Singer personnel?

A Yes.

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MR. GRAND: I think we could agree that this is a Singer memorandum.

MR. BENBOW: It is a Singer memorandum indeed.

Mr. Grand: "A plan of action was requested by Mr. [illegible]eker which would specify definite steps to be taken [illegible] solve the problems inherent in this unit. He also indicated that we should perform reliability tests on complete units to ascertain whether any new problems could be discovered which would cause malfunctions in the field."

Item labeled VI on the fourth page, entitled "Product Reliability Testing," the memorandum reads:

"Several complete units will be tested with the facilities now available. These we feel are not adequate and therefore life testing equipment and procedures must be set up in the near future. I feel engineering and quality control must jointly develop the techniques to be used. I have requested information from Perma which will point out the critical areas of the unit. This information is necessary to insure adequate testing is provided. I propose that once the equipment and procedures are set up and functioning properly that the product reliability testing become the

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sole responsibility of quality control," and there is a signature line for A. Romel, Manager, Manufacturing Engineering Contract Sales.

Exhibit 39 is a memorandum from A. Romel, Manager, Department 195, to Mr. J. Fecko, Manager, General Fabrication Division, Manufacturing Division. It is dated September 17, 1964 and it is entitled "Status Report, Perma Anti-Skid Device."

This too is an internal memorandum of the Singer Company, is it not?

MR. BENBOW: Correct.

MR. GRAND: "Dear Sir:

"The following is a list of problems encountered in the above unit and the steps being taken to solve them.

"I: Hydraulic pressure switch

"1. Leakage due to O ring damage at assembly.

"2. Switches set too high.

"The problem of leakage has been traced to faulty manufacture and the use of second grade O rings by the vendor. Recent samples received indicate that the vendor has corrected this defect."

The last paragraph of the memorandum on page 3 reads:

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"I am deeply concerned about the reliability of this device in general. My cause for alarm stems from the fact that the performance testing does not detect some defects which could cause a malfunction of the unit during operation on a car. I have discussed this matter with Mr. J. Wagner and it appears that we may be able to find a means of detecting these defects. However, a better understanding of the functional characteristics of the device must be attained before proceeding. I feel it would be advisable to get a detailed specification from Perma listing all the possible causes for failure so we may incorporate tests to detect deficiencies before sending units out of the plant. I strongly recommend that the legal aspects of responsibility be thoroughly investigated so that we may be fully covered for units sold before the confidence level is determined to be satisfactory."

"Very truly yours," and then there is a signature line for A. Romel, Manager, Manufacturing Engineering Contract Sales."

BY MR. GRAND:

Q Did you in the fall of 1964 have conversations concerning the subject of the continuing problems that you have been testifying about?

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A Yes. I asked Mr. Kloby if I could meet with him after one of these -- I don't know -- I think it was after one of these inspections, and I told him that myself and the other Perma people and his people, some of his people I know, were very concerned about what had been transpiring from June to -- through this period, because at the original meeting we had Singer had told us they were going to put engineering and quality control and help get the product into mass production so that we wouldn't have any problems, because we were encountering some of these before our meeting, and I asked why at the beginning we had Mr. Sprague and Mr. -- at that original meeting that I had when we were demonstrating all the parts we had -- I think there were five engineers there, Mr. Sprague and I think Mr. -- I don't remember -- Reid, or something like that, and then there was a Mr. Comes on the program, and then shortly thereafter, in, I guess it was, June or July, the only one that I knew that was left that I was discussing things with was Mr. Romel, and then Mr. Wagner came in -- he was building some test stands -- and I expressed my concern about the units that had been out in the field and I don't know if at this meeting or previous I insisted that they be recalled and I explained to him that

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we were very concerned about an accident and he said he was too, and I told him that we had -- we were on -- my company was on the verge of bankruptcy because we had gone through about $250,000 at this point and he expressed as much concern as I did and said he would have a meeting with his management and would get back to me. I don't remember what else happened at that meeting, but he did get back to me.

Q Did he get back to you?

A Yes, he did.

Q Do you remember when these meetings or this meeting that you just described took place?

A I think they were in late September or October.

Q What happened thereafter on this subject?

A I went back to Elizabethport, I had somebody from Perma with me, and --

Q Who was with you?

A I don't know if it was Mr. Krawczyk or Mr. Karp. I am not sure.

Q By the way, you have testified a number of time about Mr. Karp. Is Mr. Karp alive today?

A No. Mr. Karp died I think December -- around Christmastime about a year later.

Q You say you went back to Elizabeth?

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A I went back to Elizabethport, the Singer office.

Q And met with whom?

A I met with Mr. -- well, I was told I was going to meet with Mr. Kloby and Mr. Morris, who was the general manager, and I met with Mr. Kloby first and he told me that -- well, on the previous -- can I back up to the previous meeting first?

Q If you left something out of it, sure.

A Yes. He explained that the reason that they hadn't kept all the engineers on is because the budget didn't call for all those engineers at that time and I asked why they hadn't put an automotive engineer on, which they said they would do, but at this meeting Mr. Kloby -- there was something -- I don't remember if there was any conversation at the previous meeting or on a telephone meeting or what, but there was some reference prior to this meeting about my turning the patents over to the Singer Company and then Singer would have total responsibility for the patents, the marketing and everything, and because the profit margin would be different because they would then be in their position of owning the patents and structure the pricing and be selling the product, they could then have

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the total responsibility for design, engineering, and be able to put -- justify a larger budget and be able to put the people on that we talked about, and then I was brought to Mr. Morris and we were talking about what type of arrangement could be made for Perma to turn the patents over to them.

Q What you have been describing as taking place before you met with Mr. Morris, is that a conversation you had with Mr. Kloby?

A Yes.

Q And then you and Mr. Kloby went in to see Mr. Morris?

A I met Mr. Kloby in his office and then we -- after some conversation we went in to this conversation I related to, we went into Mr. Morris' office.

Q What happened with Mr. Morris?

A We were negotiating the terms of what ended up as the December agreement.

MR. BENBOW: Your Honor, while we are hesitating, I don't know if it is specifically objectionable or if I want to raise any such objection, but there was much looseness in the response, and much volunteering in that last answer, and I don't know whether counsel thinks it would be helpful to try and clarify it or to leave it in

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DIRECT EXAMINATION CONTINUED

BY MR. GRAND:

Q Mr. Perrino, on Friday, shortly before we recessed, you testified concerning a conversation with Mr. Kloby, and Mr. Benbow expressed his thought that the testimony was somewhat confused and that you had moved back and forth in a couple of conversations.

I wonder if you would tell us again the conversation that you had with Mr. Kloby in the fall of 1964 on the subject of the continuing problems that you had encountered.

MR. BENBOW: Objection, your Honor, to the form of the question. It is vague.

THE COURT: See if you can rephrase it, Mr. Grand.

Q Did you in the fall of 1964 have conversations with anyone from Singer on the subject of the reports, inspection reports, that you and the people from Singer had reviewed?

A Yes, I did.

Q Can you tell us what the conversation or conversations were, when they took place and with whom they took place?

A I met with Mr. Kloby and I told him --

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Q Can you tell us when you met with Mr. Kloby?

A I think it was in late September or some time in October of 1964.

I told Mr. Kloby that I was very concerned with what had happened between June and this period of time and I reminded him of the original promises that were made to Perma by Mr. Kloby and Mr. Morris and the people who were at the meeting relative to the --

Q The people who were at what meeting?

A At the meeting when we first met in February where the Singer Company -- I told the Singer Company of what problems we were starting to have in bringing the product from the preproduction sample stage to mass production. I reminded him that they had promised to put their quality control and engineering help so that if any modifications were necessary, that they would assist us in this capacity.

I also reminded him that the meeting we had after that at Singer, where I described and we went over all of the parts and the prints relating to bringing the product to production, were also related to avoiding any problems in mass production so that if a particular process would be used to make a part we would have the benefit of their engineering help.

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I also pointed out that at that time there were approximately five engineers that were at that meeting and --

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tp1 Perrino-direct

Q What meeting?

A At this meeting in -- I think it was in probably March prior to the June contract, and that there were approximately five engineers there; Mr. Sprague, I think, a Mr. Reid -- I'm not sure of that name -- and Mr. Gomes and I think Mr. Romel was.

Then shortly thereafter there was only two engineers, a Mr. Romel and Mr. Wagner, who was working on the test stands, and that we had encountered all of these problems of defective parts, parts that were made with flashing on them, the things we described the other day, and that as a result I was concerned about the product which was going into the field, about what would be done with that, what this was doing to my company.

Q What did you tell him about that?

A I mentioned to him that my company was sending -- putting my company in a position where it was not able to function any more, that we would be bankrupt if we continued on that basis.

Mr. Kleby stated that he was as concerned as I was about the problems and that he would bring this to the attention of management.

Also when I asked him about why there were only two engineers, he mentioned that they had been taken off the

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program because of budget requirements. He said he would bring it to his management and get back to me. That's basically all that I remember of that conversation.

Q Were there subsequent conversations on this subject?

Was there another meeting? Yes.

Mr. Kloby called me on the telephone and --

THE COURT: Before we get into another meeting, can you tell us when the other meeting took place?

THE WITNESS: The next meeting took place -- I think it was in October or maybe late in October. I'm not sure.

Q In reference to the meeting you just described, when did it take place? How much later?

A This was probably two weeks later or maybe a week later. I don't really remember.

Q All right.

A Mr. Kloby called me and asked me if I wanted to come to New York. He made some reference on the telephone as to what we might be talking about. We were talking about patents and so on.

I met with Mr. Kloby -- he told me I would be meeting with him and Mr. Morris, who was the general manager at Elizabethport.

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Q Where did you meet with these gentlemen?

A I met at Elizabethport at their office.

Q You mentioned New York a minute ago, that's why I asked.

A I'm sorry, I may have said New York, but it was Elizabethport that both of these meetings took place.

Q With whom did you meet when you went to Elizabethport?

A I met with Mr. Kloby --

Q This was Mr. Kloby alone now?

A Yes. I met with him first in his office and he discussed generally what the meeting wasgoing to consist of.

He told me that it would be in reference to my assigning my patents, or Perma assigning its patents to Singer Company and that if that was accomplished, if we did turn them over to Singer Company, they would then be a different profit structure for Singer in manufacturing and if the patents were theirs they would be totally responsible for design and everything that went with it and we would be operating under some royalty arrangement and then they could justify more expenditure on the program.

I don't remember much more on that.

I told him that I felt --

Q Do you recall anything else about that meeting

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before you went in to see Mr. Morris? Was there anything said on the subject of additional personnel?

A Yes, I thought I just mentioned that.

Q What was that?

A Mr. Kloby told me that a new budget would be established because now Singer would own the patents, would, in effect, own the total patents and they would approach it differently by putting in the people who we discussed previously, engineers, automotive people, and then we went in to see Mr. Morris.

Q And what happened at that meeting?

A The meeting with Mr. Morris and myself and I think Mr. Karp was there related to the type of arrangements that could be made in order to transfer the patents to Singer and ultimately Singer -- we did assign the patents to the Singer Company.

Q Before we get into the assignment of the patents, let me ask you about the 2000 units or approximately 2000 units that you testified a couple of days ago were shipped under the June contract.

Whatever happened to those units, if you know?

A I discussed with Mr. Kloby and Mr. Romel my concern and Perma's concern and they discussed theirs and the units, I believe, were recalled. I don't know exactly

when.

Q Do you know when you discussed that subject with Mr.Kloby and Mr. --

A It was some time in -- well, there were two meetings on it. One was early in the June contract and the last one, I think, was in September probably.

Q But in any event, the 2000 or however many units there were were recalled from the field?

A I believe they were, yes.

Q You testified also about there having been some to three to five thousand unitswhich had been manufactured prior to the June contract under the relationship with Worcester Stamped Metal?

A That's right.

Q And I believe you also testified that that three to five thousand increased to some 50,000 under the June contract?

A Yes.

Q Can you tell me how that took place?

A In June there were approximately three or four thousand units that were coming into the Singer Company and we inspected -- this is Perma and Singer inspected some of the first product that came in. I don't know if it was June or July. But I do know that at meetings after

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attention to the fact that this page, which is a pro forma income statement, or, could we agree, a projection --

MR. BENBOW: No.

THE COURT: No.

MR. GRAND: A pro forma income statement for the years 1965, 1966 and 1967, and under "Royalties" it lists in the first column under the year 1965 $295,500, under 1966 $449,070, and under the third year, 1967, $898,140.

The next document I intend to offer, your Honor, is the December contract, Exhibit 60.

THE COURT: Here is the question of the schedules.

MR. GRAND: To the extent --

THE COURT: Hold it.

Ladies and gentlemen, you often, I am sure, sitting in the jury room wonder what we are doing out here when you are in having a smoke or whatever you may be doing. Often what we try to do is to take care of housekeeping details so that the trial can move more smoothly when you are sitting out here and you are paying all your attention to it.

Now, prior to the opening of court today a question arose as to a particular schedule, whether it

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was appended to this contract, and I think that we can take care of it without inconveniencing you. So under the circumstances we are going to take our morning break. I would think that we can take care of it in less than 10 minutes. So you have time for a cigarette and that's about all.

(Recess.)

(In open court; jury not present.)

THE COURT: Have we resolved the difficulty?

MR. BENBOW: We have, your Honor.

MR. GRAND: I think at some point, your Honor, we should either correct the June contract that is in evidence by separating a schedule attached to it that doesn't belong to it.

MR. BENBOW: That is a Schedule A.

THE COURT: All right.

MR. GRAND: For present purposes, in offering the December contract, I have been given a copy of the complete document by Mr. Benbow, and we could designate that to be 60A, and I would offer 60A instead of 60.

THE COURT: All right, fine.

(Plaintiff's Exhibit 60A was received in evidence.)

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A Yes, I did.

Q Can you tell us what the discussion was and when it took place?

A Yes. We discussed the fact that new models were coming out or starting to come out with disc brakes and that the pressure requirements made it necessary for the Perma-Vac to put out or to modify the Perma-Vac to put out the pressure, a much higher pressure which would now be required for these new model cars with disc brakes.

Q Did Mr. Romel say anything?

A Mr. Romel -- I explained to -- well, he also told me that he would like to solve the problem of displacement which we had previously talked about, and I explained that the way to solve both these problems was to make a bigger Perma-Vac with a bigger can and a bigger piston so you could get more fluid in it and also be able to accomplish the higher pressures which you needed for these new model cars.

Q What did he say?

A And Mr. Romel wanted to know what would be involved, and I told him a bigger can, a bigger -- almost all of the parts of the Perma-Vac would have ro be made bigger. And he told me that he did not want to --

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he wanted this to be done within the confines of the present inventory. He wanted the output of the unit and displacement, something to be worked out so he could use the units which were on hand in inventory.

Q What was your response?

A My response was I didn't know at that moment whether we could do it or not, but that I would -- I asked him if he had any ideas on it, and he said no, he had tried some things and he asked me if I would proceed to come up with a solution and if I could do it with a -- I don't know the period now. I think he said two weeks or ten days, some period like that.

We proceeded to work on that.

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Q You say "We proceeded to work on it."

What did you do or who did --

A Perma worked on what is now called the transfer valve.

Q Can you describe it?

A Yes. You want me to describe what it does?

Q Why don't you first describe what it does and then I will show you one.

A What it does, we described the Perma-Vac before and we said that vacuum, when introduced to the brake of the can, pulls the piston back and releases the brakes and then when the vacuum is take out of the can the spring in the Perma-Vac pushes the brakes back on, so what the transfer valve does, it takes and transfers upon reapplication of the brakes, it transfers the vacuum that was in the back of the can to the front of the can so that you not only have the spring pushing the brakes on, but you now have vacuum sucking the piston forward pulling the piston forward, so, therefore, you would getnot only the pressure from the spring but also from the vacuum as well. You can obtain much higher pressures.

Q Can you identify Exhibit 78? Can you identify that?

A Yes.

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Q Do you know when that unit in that form was built?

A I think in the spring of 1965. I may be wrong on that.

MR. BENBOW: Is that March or June or what?

THE WITNESS: I don't remember.

MR. BENBOW: Or February or July or January or August?

THE COURT: He indicated he doesn't know.

Just some time in the spring, is that the best you can do?

THE WITNESS: I think it was in the spring, your Honor. I can't be positive.

MR. BENBOW: With that clarification, no objection, your Honor.

THE COURT: All right.

(Plaintiff's Exhibit 78 received in evidance.)

Q My question was or my statement was, please explain to the jury the difference in operation of the unit ~~was~~ as described on Exhibit 5 and the unit that you have in your hand, Exhibit 78.

A In the previous -- in the unit we had described previous, when the brakes are released the vacuum entered this chamber in the back of the Perma-Vac where the spring

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is, pulls the piston backwards to the piston A and releases brake pressure. When the vacuum is taken out of the back of the Perma-Vac, the spring pressure reapplies the brakes.

What the transfer valve incorporated, when the vacuum is takenout of the back of the can, atmospheric pressure enters and the spring pushes the piston forward, but in addition to that the transfer valve diverts the vacuum and it pulls -- it helps the spring push the piston forward by sucking the piston forward the same way as it released the brakes as I just mentioned, but this time you have the spring pressure and the vacuum pulling it forward so you have much higher pressures with the same sized piston in the front of the Perma-Vac.

Q Perhaps you could explain the use of the word "transfer."

Does the valve transfer vacuum from some place to another place?

A Yes.

Q If so, from where to where?

A It takes -- the transfer valve, when the atmospheric pressure enters the back of the can, which allows the spring to push the piston forward, the transfer valve at that instance takes the vacuum from the engine and opens a hole so that it can be taken from the engine

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to help and pull the piston forward so that you are getting the pressure from the spring as well as the suction.

Q Where does the vacuum go that you just described so that it can help ~~such~~ suck the piston forward?

A It goes in front of the piston, in front of the piston, on the side where it says B.

Q And it enters through what part that you got in your hand?

A It enters through -- the part which I have in my hand?

Q How does it enter to the front of the piston?

A It goes in the hole where it previous said air filter.

Q That is where the transfer valve is now fixed?

A That's right.

Q We jumped a little bit ahead of the story to get the explanation.

After you went back to Perma and designed this transfer valve, did you discuss it --

MR. BENBOW: Your Honor, I am not clear that the record states that. I prefer that Mr. Grand would ask questions. I would object to him summarizing the testimony in this fashion.

THE COURT: He is trying to get back on track.

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MR. BENBOW: More specifically, your Honor, has the witness testified that he designed the transfer valve in so many words? I have not heard that.

MR. GRAND: Let me go back and cover that.

THE COURT: Let's find out.

Q You testified that you went back to Perma?

A Yes.

Q And somehow got involved with the transfer valve?

A That's right.

Q All right. Tell us what happened at Perma.

A We made a sample unit and we ran --

Q What did you do before you made a sample unit?

A We made some drawings, sketches, and from the sketches we tried to prove our theory on paper first and then we went and made a sample.

Q How did you make it?

A We had a machine shop at Perma and the parts were made there and it was made at Perma.

Q And after you made it, did you speak to Mr. Romel about it?

A Yes. I called Mr. Romel and I told him what we had done.

Q Tell me what you told Mr. Romel.

A I told him that we had made -- that we had a

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solution to the request which he had previously made for displacement and pressures. I told him that with the transfer valve he would be able to vary the displacement and the pressure and use various combinations. However, the unit would now be vacuum dependent. If he was to obtain 3000 pounds of pressure or require 3000 pounds of pressure, what the unit which we sent -- we ultimately sent it to him -- with the unit we sent to him, if vacuum was lost it would revert back to only the spring pushing the pressure on so he would only have 1500 pounds, so that he should take into consideration the pressure that would be required on the -- from that automobile and take into consideration that when vacuum was lost he would be left with whatever pressure he obtained by using these two combinations of the transfer valve and the ability to change the bore size.

Q What did Mr. Romel say to you?

A He asked me to send the valve down to him, he wanted to run some tests and make some other samples, which I did.

Q What is the consequence of having less braking power in the event of a vacuum loss once the transfer valve is incorporated?

A If you were depending on the spring and the

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vacuum for your total braking force and you lost your vacuum, then it would be something less than adequate for stopping the vehicle.

Q Was that fact discussed with Mr. Romel?

A Yes. On that particular unit I sent to him I described what the upper pressure was and what the effect of the vacuum loss would mean.

Q Do you recall what, if anything, he said on that subject?

A This is when he said, "Send me the unit, I would like to run some tests or make other samples."

Q And did you send the model that you had made at Perma?

A Yes, we did.

Q Do you know what a restrictor valve is?

A Yes.

Q Did there come a time when you learned about the use of a restrictor valve in connection with your invention?

A Yes.

Q Pardon me?

A Yes.

Q When did you first learn about the use of a restrictor valve with your -- I shouldn't say with your,

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Q Did you, Mr. Perrino, meet with representatives of the Singer Company on August 30, 1965?

A Yes, I did.

Q Can you tell me where the meeting took place and who was present first?

A The meeting took place at Parma and Mr. Person of the Singer Company, Mr. Boriss of the Singer Company and I think one of the persons -- I don't know who it might have been -- and I was there, Mr. Di Benedetto.

Q Try and keep your voice up. I know this whole process today has been exhausting.

A I was there, Mr. Di Benedetto was there, Mr. Krawczyk and Mr. Karp.

Q From Parma?

A Probably Mr. Mainelli also.

Q Can you tell us what was said at that meeting?

A Yes. Mr. Person said, "This may come as quite a shock to you, but the Parma program has been stopped."

I asked him why, because just recently I had talked to Mr. Kloby and Mr. Romel and they said that the product problems had just been resolved, and he said, "Did you know that the product -- we had to recall units from the field because there were some defects in the product," and I said, "Yes, I did," and this is when I mentioned that

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Mr. Kleby and Mr. Romal told me they were resolved, they were recalled and then the problems were resolved.

He says, "Well, the unit has to be" -- he said, "One of the things we have to do is the unit has to be fail-safe."

I says, "I don't know what you mean. I know we had problems up in the field, but are you aware of why the problems occurred," and I brought out a report, which was the ones we had, memorandums we had from the Singer Company previously that showed all of the problems we had with it, the cam gear hanging up, the microswitches, the rotary valves, the switches leaking fluid, and so on, and I asked him if he was aware that this was the problem, this is what caused the defects out in the field, that the product, the parts weren't made properly.

He said, "In any event, the product must be made so that no matter what it must revert to the conventional braking system."

Q Who is talking now?

A Mr. Perucn. I told him that we had a fail-safe feature in the unit and then Mr. Boriss started speaking and he said that -- he gave me his definition of what fail-safe would mean. He told me that fail-safe would mean that no matter what occurred the product must revert

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back to the standard braking system.

I said, "Even if the product is not made properly, even if parts are missing?"

He said, "No matter what."

I said, "Mr. Boriss, I don't know anything that meets that definition. I have worked with a lot of automobiles and I don't know of anything that would meet that definition, that no matter what you did with it it could not fail."

He said, "Well, power brakes or power steering would meet that definition."

I said,"Mr. Boriss, you have to be wrong because I worked on power brakes. I know that if you have a vacuum loss you do not have the same braking you had before, you have something else, because the pedal is very hard and difficult to apply, you don't stop in as short a distance."

I said, "Further, I know of at least six items in thepower brake system where if a seal leaked" -- I mentioned one particular one -- "if a seal leaked fluid would run right into the engine because it was vacuum in the chamber and it would suck the fluid from the master cylinder reservoir and you would have a total loss of brakes," and I mentioned several other instances, such as fittings, seals, things of this type, which would cause a

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total loss of brakes, and I told him what experience I ha[d] with power steering, if you lose a fanbelt or a hose breaks you lose your power steering and you do not revert back to the conventional system because they change the ratio on the steering when they put power steering on, which makes it very difficult to turn and there is a lot of play in the wheel, and even then if the fluid was trapped in the system then you couldn't steer the car at all.

I mentioned that the automotive industry -- I couldn't understand how his definition fit the automotive industry or anything, because -- oh. He then gave me his reasoning or his further explanation of fail-safe.

He said that "You will have to agree with this, Mr. Perrino," he says, "that the braking system of a car may have a hundred parts and it has a theoretical possibility of failure of maybe one in a million and the mere fact that you put your unit on top of this unit as an add-on, there is a theoretical possibility that it too could have a one in a million failure, so instead of a theoretical possibility of one in one million failure you have a theoretical possibility of two in one million failure."

I told him I felt this was an unreasonable explanation, because I know that all of the products that I have ever seen, for instance, power brakes, power steering,

all of those are weighed by -- even the anti-skid device -- all of these, the advantages are weighed -- for instance, we know that 20 per cent -- from what my people had told me -- of accidents occurring were the result of skidding and we know that power brakes help stop cars quicker. So all of the advantages so far outweigh the theoretical possibility of the part failing that I could not be in agreement with his definition of what the word "fail-safe" meant.

I mentioned to him that even aircraft that had braking systems had adopted anti-skid devices.

Q What did he say to this?

A He insisted that he felt his definition of -- I don't know that my explanation of what happens in the power brake unit ever got through to him. I think --

THE COURT: No.

MR. BENBOW: Objection.

THE COURT: Objection sustained. We don't want your impression. We want what he said to you, what you said to him.

A He repeated that no matter what, no matter what reason, the underlying system of the automobile should not fail, and I told him again that I could not understand how you could substitute a good quality product or reliability built into the product by trying to make the unit -- in

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other words, he was using the word "fail-safe" that it should revert automatically and I stressed that the products, the pieces should be made properly, that's what the automotive industry depended on, that even on the braking system they have rubber cups in there and if you just break one rubber cup you lose your entire braking system. So reliability in building each piece and having it -- every part inspected was the answer.

Q That's what you told Mr. Boriss?

A Yes. And I asked if we could help, if we could work towards a goal to some standard that would be acceptable to Singer and he told -- I think Mr. Person -- I don't remember what he said now --said they would get back to us.

Q Do you recall how that meeting ended or terminated?

A I offered to work with Singer to try to obtain a reasonable goal because I felt that the problem was not that this probability -- I mean, it was one of trying to correct --

MR. BENBOW: Objection, your Honor. He is going off from what the termination of the meeting was to what he felt.

THE COURT: I am not sure. Let's hear the question and the answer again.

A I told him --

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THE COURT: Hold it.

Q I asked how the meeting terminated and that was intended -- I may have misled you -- to elicit from you what was said by way of termination of that meeting, not just your feeling.

Tell us what was said and how the meeting ended in that sense.

A Yes. In talking to Mr. Boriss, I said that I would like to work towards eliminating the problems which had occurred in the unit before and this was specifically referring to the bad pieces which were put in the unit which we felt was the reason they caused -- the malfunctions occurred in the field.

THE COURT: Let's get back to the question. How did the meeting end?

A It ended by Mr. Person saying that he would get in touch with us if we could be of any help to him.

Q After that meeting did you have a conversation with Mr. Person on the subject of the Cornell Labo[illegible]?

A Yes, I did. I found that Singer was going to --

Q Don't tell us what you found.

A Yes.

Q Tell us what your conversation was with Mr. Person.

A I asked Mr. Person that if he was to send units

"Mr. Romel has given his opinion on the engineering suggestions you make, and here to we regret that we are unable to accept your views.

"We are happy to note your understanding that the views of Singer and Perma are presented without prejudice and subject to that understanding this will confirm our plans to meet and hold further discussions on November 22, 1965," the same date as the letter.

"Mr. E.A. Salter, your patent attorney, has requested certain information from our Patent Department and we will be pleased to furnish it to him upon the same understanding.

"Very truly yours,

"B.C. Person, Director of Technical Services."

Q Do you know, Mr. Perrino, whether you had received this letter before you met with Mr. Person or do you not recall?

A I am pretty sure that we met before I received the letter. I think the letter was probably enroute.

Q Tell us where the meeting took place. Let me withdraw that.

I think I interrupted you when you were telling us about a telephone conversation with Mr. Person that preceded the meeting.

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A I said to Mr. Person that I was very concerned that we had sent drawings and performed work and it appeared that Singer did not want to go forward with the program and I asked him if they would -- if he would please level with me because my company was expending money that we were borrowing and we were not -- it was causing a lot of hardship on the company and would he please level with me if the company -- if Singer did not want to go forward with the program would he tell me.

Q What did he say?

A He suggested that we meet and we had a meeting.

Q And that meeting took place where?

A At the Biltmore Hotel, in the lobby.

Q In what city?

A In Providence, Rhode Island. He came to Providence. We met there.

Q The meeting took place in the Biltmore Hotel in Providence, Rhode Island?

A That's right.

Q It was just the two of you?

A That's right.

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Q Can you tell me what you said to him and what he said to you?

A Well, the conversation -- I repeated what I had said on the phone to some extent. I asked -- I told him that we had spent a lot of time developing what we felt were fail-safe features which even took into consideration a part that may not be made right, we tried to take into consideration the entire unit, and it just did not appear that Singer wanted to go forward and would he let me know what their real desire was at this point.

He said, "Very bluntly, Frank, we do not want to be in the brake business." He said, "Our people at Elizabethport should not have gotten into the brake business."

Q Do you remember anything else that was said at that meeting by either Mr. Person or you?

A I said -- I became very upset and I said, "This is one heck of a time to decide that you don't want to be in the brake business."

He mentioned that the Consumer Products Division didn't want to be in the brake business. I said, "This is one heck of a time to tell us you don't want to be in the brake business, a year and a half later.

"If you are convinced that the modifications suggested result in a design which will not, under any conditions, impair the utility of the underlying system, I believe a meeting between yourself and our engineering staff is warranted and would be pleased to arrange for such a meeting.

"Very truly yours, B. C. Person, Director of Technical Services."

BY MR. GRAND:

Q Mr. Perrino, did you or anyone from Perma respond to the December 23, 1965 letter?

A No.

Q What was the reason for not responding?

A Because Mr. Person made it very clear to me that Singer did not want to go -- be in the brake business. So I told Mr. Mainelli there was no point in going forward.

Q How many fail-safe features or components did you submit to The Singer Company with your letter of November 8th?

A Two.

Q Were there two submitted in connection with the Perma-Vac with the transfer valve?

A Yes, there were two.

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Q Mr. Perrino, I would like to call your attention to a representation made in the sound track of this film that we have all just seen and heard --

MR. GRAND: I object to the characterization --

THE COURT: Can we refer to a statement in the script? All right?

MR. BENBOW: That is what I meant.

MR. GRAND: That is my objection.

Q -- to a statement made in the sound track of this film concerning the fail-safety of the Perma anti-skid control.

The statement was:

"The Perma anti-skid control carries a full year warranty and includes a fail safe feature which

will automatically revert to the standard braking system in case of failure."

Mr. Perrino, at any time prior to December 21, 1964 did you ever state to Singer that this representation --

MR. GRAND: I object to the form of the question.

Q -- that this statement in the --

THE COURT: Let me hear the rest of the question.

MR. GRAND: He has corrected it.

Q -- that this statement in the Perma promotional film concerning fail-safety of the Perma anti-skid control was false or misleading?

A No, because it was true and when the product is made propertly it reverts to the standard braking system.

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Q Mr. Perrino, did not the sound track of the promotional film, which you did show to Singer at the first meeting, indicate that Motor Vehicle Research of New Hampsire was an independent laboratory?

MR. GRAND: I object. The document speaks for itself.

THE COURT: Do we have the sound track?

MR. BENBOW: We have a transcript of it, Defendant's Exhibit 1, your Honor.

THE COURT: All right.

Q Will you respond, Mr. Perrino?

THE COURT: I think the question is answered by the fact that we do have a document in evidence which says that the sound track does say that Motor Vehicle Research of New Hampshire was independent. I forget exactly how it is phrased.

MR. BENDOW: It states:

"Motor Vehicle Research of New Hampshire is one of the independent laboratories that has tested the Perma anti-skid unit." That is at page 117 of Defendant's Exhibit 1.

THE COURT: All right.

BY MR. BENDOW:

Q Do you recall that, Mr. Perrino?

A Yes.

Q Does Report No. 13 reflect that Mr. White, the director of Motor Vehicle Research of New Hampshire, had been at any time either a director or a stockholder of Perma?

A I don't believe it does, no.

MR. GRAND: Your Honor, the document speaks for itself.

THE COURT: All right. The witness has answered. Go ahead, next.

Q Is there any statement in Motor Vehicle Research Report No. 13 to the effect that Mr. White received shares of stock in Perma as payment for the tests reported in Report No. 13?

A No, I am sure there is not.

MR. GRAND: Object.

THE COURT: He has already answered.

MR. GRAND: You get the message of this colloquy here? When I am trying to object you are not supposed to be answering.

THE WITNESS: I didn't see you.

BY MR. BENDOW:

Q When you turned over Report No. 13 to Singer did you tell Singer that White had been either a director or a shareholder of Perma?

A No, I did not.

Q When you gave Singer this Report No. 13 did you tell Singer that Mr. White had received stock as compensation for his testing services?

MR. GRAND: I object, your Honor. It hasn't been established that at that time he had received stock.

THE COURT: I think it was. I will let the question be answered.

A No, I did not tell Singer that Mr. White was to or did receive stock.

A Because it was--

Q And that was recalled.

A It was because it was a very important discussion on it relating to the leaky pressure switches.

Q To your knowledge, Mr. [illegible] how many units which were shipped during or under the June 1964 contract had to be retrieved or replaced?

A Howmany had to be retrieved or replaced?

Q Yes.

MR. GRAND: Haven't we asked and answered that?

THE COURT: No, let him answer if he knows.

A I don't know how many units there were, Mr. Benbow

Q You know there were 500?

MR. GRAND: At least.

A I know we specifically talked about the 500 and I assumed at the meeting if we were talking about 500 and if there were more they would have been recalled, too.

Q It wasn't just talked about, was it, Mr. Perrino, they were, in fact, retrieved and replaced?

A Well, there was a period of time when we thought it was the pressure switches I suggested that I had a man out in Ohio and that I would have him go immediately to the distributor and pull the switches in, recover, retrieve them. Before he could do that we informed him that the units

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had to be recalled so we were going to recall the entire units.

MR. BENDOW: I ask to have marked for identification, your Honor, Defendant's Exhibit 206 for identification.

(Defendant's Exhibit number D-206 was marked for identification.)

Q Will you identify this document, Mr. Perrino?

A It looks like a Perma invoice related to 500 units to Wright Car Controls of Toledo, Ohio.

Q What is it dated, Mr. Perrino?

A It says 12/2/64.

MR. BENDOW: I offer it in evidence.

THE COURT: Do you object to it, Mr. Grand?

MR. GRAND: I am not sure what it is. Maybe we could have the witness identify what it is.

THE COURT: I believe he said it looks like a Perma invoice.

THE WITNESS: It says "No charge" on there.

MR. GRAND: I don't object to it. I just think the record could benefit from a little clarification.

THE COURT: We will take it in. 206 is received in evidence.

(Defendant's Exhibit D-206 received in evidence.)

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Q You volunteered a moment ago that it says "No charge," Mr. Perrino.

How did that come to take place that 500 units went out at no charge?

A First of all, I have to make it clear that these Perma invoices were sent out by Singer.

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Monday --

MR. GRAND: I object to that. If you want to ask the witness a question, you ask the witness a question. I don't think you have the power to direct him to do anything other than to show up here.

MR. BENBOW: It will expedite all our time, Mr. Grand, including yours, but if you prefer this procedure of unrefreshed recollection, let me read from Mr. Perrino's deposition on page 167, page 00495 of the Circuit Court opinion, line 14:

"Mr. Bush: I ask the reporter to mark it as Defendant's Exhibit 45 for identification, Perma Research & Development Company invoice No. 002750," the same number on what is now Defendant's 206 in evidence, "dated December 2, 1964," which is the same date, "marked as Defendant's Exhibit 45 for identification, as of this date."

BY MR. BENBOW:

Q Prior to its being identified, Mr. Bush asked at line 11 on that page of you, Mr. Perrino;

"I ask you again if this refreshes your recollection that there was a second shipment of 500 units to replace the first shipment of 500 units.

"A This seems to be the replacements for

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the units we discussed.

"Q Mr. Perrino, there is no doubt about this, is there? Don't you recall yesterday that we had a very difficult time establishing which 500 units we were talking about?

"A That's right."

There are further questions and answers on this subject both beforeand after which I will not burden the record with.

MR. GRAND: I must confess I can't conceive how reading this would have refreshed his recollection any better than this did.

MR. BENBOW: Maybe the fact that he spent a good bit of time on deposition testifying as to this document, Mr. Grand --

MR. GRAND: He testified as to what it ~~seemed~~ to do then and that's about all he can testify to now.

THE COURT: Fine. Everybody have a nice Thanksgiving.

This court stands adjourned to Monday at 10.

MR. BENBOW: Thank you very much, your Honor.

(Adjourned to November 26, 1973, at 10:00 a.m.)

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Q At the time Perma entered into the December, 1964, contract with Singer, were you of the opinion that the Perma device was perfected?

A I believe that the concept and the samples and the testing we had done were adequate. My concern was getting it into mass production from that point and that's where we lacked the expertise or the knowledge. This is what we were looking to Singer for.

Q Were you of the opinion that the Perma device was perfected?

MR. GRAND: I think he has answered the question.

MR. BENBOW: I don't think he has, your Honor. I don't think the answer was responsive.

THE COURT: Go ahead, I will let it go.

A I believe that the unit did what we believed it would do. I believe that a product continually needs modification, updating, improvement. Every product does. So when you say was the product perfected, I believe that it

was -- it was acceptable and doing what it was intoned to do.

Q Did you tell Singer on or about December 21, 1964, that the Perma device was perfected?

A I don't remember a conversation saying this product was perfected.

I believe we told them what it did, we showed them what it did and we gave them units and I think that we conveyed to them the message that the product was ready to be put into mass production if we resolved the problems we had discussed.

Q Mr. Perrino, let me hand you a copy of Defendant's Exhibit 53, which has just been received, and perhaps ask you to identify it.

A It appears to be an affidavit that I signed during the litigation.

Q Dated November 18, 1969, as Mr. Grand has stated, I believe?

A 18th -- November 18th, right.

Q And is it true that you worked with Mr. Grand in the preparation of this affidavit?

A Yes.

Q At Paragraph 13 of this affidavit, Mr. Perrino, you state, "Whether the device was fail-safe when Singer decided not to market it is the core of the present dispute between Perma and Singer. I, of course, firmly believe that it was."

Does this statement indicate your firm belief that the device was fail-safe at the time Singer allegedly decided not to market it?

MR. GRAND: I object to it. The document is in evidence. It now speaks for itself.

THE COURT: No, I will permit it.

A I believe that the Perma device with the modifications which were put on it which we believed would allow it to revert to the braking system even in the event of a production malfunction was -- made it fail-safe, yes.

Q So the answer is yes?

A Yes.

Mr. Benbow --

THE COURT: No, no. Wait for the next question.

Q Did you also have a firm belief that the device was fail-safe on or about December 21, 1964?

MR. GRAND: Your Honor, I object to this whole line of questioning. I think his opinion is irrelevant

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to the issues before the Court.

THE COURT: Go ahead, answer it.

A In December of 1964 I realized, I think all of us did, that the product's parts were not being made properly and that the fail-safe feature in there, if the parts were made properly, would give you fail-safe operation in that it would revert to the conventional braking system.

MR. GRAND: I don't understand that answer.

Q So if the parts were made properly, the device was fail-safe in December, 1964?

A I said that if the -- if the product was made properly and the parts that were in it were functioning properly, it would revert to the standard braking system and the fail-safe feature would revert it to the standard braking system in '64.

Q Did you tell Singer that the fail-safe feature worked?

A Yes. I -- we complained that the fail-safe feature was not working and when it was made properly we ran tests and Mr. Romel even indicated that just polishing a cam gear gave it 100 per cent reliability as the cam gear or the fail-safe working.

Q But if it was manufactured properly, then the fail-safe feature worked?

A Yes.

Q At the time Perma entered into the December, 1964 contract with Singer did you believe that Singer had an obligation to attempt to perfect the device?

MR. GRAND: I object.

THE COURT: Sustained.

Q At the time Perma entered into the December, 1964 contract with Singer did you discuss with Singer whether or not Singer had an obligation to an attempt to perfect the device?

A I think the word "perfect" is kind of misleading. I believe that Singer had the same obligation that they had under the '64 contract to make sure that the product --

MR. GRAND: You were asked about a discussion, not your belief.

THE COURT: I was about to strike it.

We are talking about what you said to them and what they said to you.

A I did not discuss anything about perfecting the device.

THE WITNESS: I expressed my concern to Mr. Kloby about the problems we had under the June contract, the date, and Mr. Kloby told me that if they owned the patents that they could put more of a budget on, more engineering people, and bring the product to market in addition to having Singer do a national marketing job through its marketing organization.

I don't remember the exact words but --

THE COURT: All right.

Go ahead, Mr. Benbow.

BY MR. BENBOW:

Q Did you believe on or about December 21, 1964 that Singer's need to perfect was limited to the elimination ~~elimination~~ of defects in Singer's manufacturing tech-

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niques?

MR. GRAND: Objection.

THE COURT: Sustained.

Q In plaintiff's memorandum in response to defendant's reply memorandum dated January 6, 1970 -- and this was on the second summary judgment motion -- there is the following statement at page 8:

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"As plaintiff has said repeatedly, the product at all times was ready for mass production and was marketable; the only perfection required was in Singer's manufacturing."

Do you agree with this statement, Mr. Perrino?

MR. GRAND: I object.

THE COURT: I will permit it.

MR. GRAND: What difference does it make?

THE COURT: It doesn't matter. It is quite clearly lawyers' argument. The document is signed "Respectfully submitted, Poletti, Freidin, Prashker, Feldman & Gartner, of Counsel, Paul R. Grand."

MR. GRAND: I doubt that this man ever saw the document before it was filed. I can't conceive of the value of Mr. Perrino's opinion in 1973 as to what the lawyers said in 1970 in a response to a reply memorandum.

A I don't know if I even ever read it, Mr. Benbow.

THE COURT: That is not the question. Would you repeat the specific question, please, Mr. Reporter.

(Question read.)

MR. GRAND: Your Honor, I am going to object

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to it on another ground. I think this is simply a back-door way of getting his opinion as to whether it was perfected, should have been perfected, whether Singer's duty under the December contract was to perfect it in terms of this man's opinion. I don't think it is going to advance the decision you have to make one bit, but I think it is going to subvert the earlier rulings.

THE COURT: I will still permit it. Go ahead.

Do you agree or don't you? Yes or no.

THE WITNESS: Can I --

THE COURT: You want to read it?

THE WITNESS: Yes, sir.

A Can I answer this in two halves, your Honor? Because the product at all times was ready for mass production portion of it, I believe that the pre-production samples or preproduction product and the concept was ready for mass production. I think the -- problem we got into is when it went into mass production. I think that's the only way that I can answer that half. And had it gone into mass production properly it would -- have been marketable.

And the other half, where it says the only perfection required was in Singer's manufacturing, I think

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had Singer worked on the product and helped us modify it or put it in mass production it would have been a perfected product ready for marketing.

I think that's the only way I can answer that.

MR. BENBOW: Could you read that back, Mr. Reporter.

(Answer read.)

BY MR. BENBOW:

Q You referred in your answer I believe to concept ready for mass production. What do you mean, the concept was ready for mass production?

A I mean that the product was invented and developed to the stage where preproduction samples were ready to what we believed ready for mass production. The product worked, it did the things we believed it did, it was supposed to do. But when it was put in mass production or when it was to be put in mass production there were many things that had to be resolved and I believe that we needed engineering help in this respect, types of materials, how they would affect wear, because when you put something in mass production you use sometimes different materials or different methods, sometimes you change a part so that you can facilitate manufacturing, and I think this is where -- this is what caused the

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problems and this is why some of the parts came out improperly and I don't think quality control was exercised in making sure these parts came out as the preproduction samples did. When I say concept I am talking about the idea.

Q Are you saying therefore that the design was ready for mass production?

A Yes.

Q And was marketable?

MR. GRAND: I object to that. I don't know how a design could be marketable. You market products in this world, your Honor.

THE COURT: I agree. You want to reframe the question?

MR. BENBOW: I thought I was referring to what the witness' previous answer had been, your Honor. I am just trying to find out what he means by it.

He has previously testified that the design was ready for manufacture. I am asking if he thought the design was ready for the market.

MR. GRAND: I repeat my objection.

THE COURT: I am afraid you can only sell a design once, unless you make some kind of entirely different type of design.

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MR. CHANDLER: I argued three motions which Mr. Grand proposed to announce to settle litigation as to the meaning of the contract and I can state I consider that a very extraordinary statement. The only time the plaintiff ever raised a question as to the meaning of the contract was on the first motion.

As your Honor knows, in their complaint they alleged that the December contract was void because it was illusory, because Singer had no obligations whatever under the very contract which they are now trying to sue for breach. I replied there under the Duff-Gordon case it was obvious we had an obligation to manufacture and market. That was the extent that the meaning of the contract was litigated on that motion.

On the motion before Judge MacMahon I raised the point on the basis of some cases that I cited when a contract such as this December contract for patent assignment gave the assignor right of recovery of the patent if the assignees did not pay certain sums in developing the product, that that was an exclusive remedy.

Judge MacMahon overruled that on the ground that all the cases that I cited were cases where there was only an implied obligation. Well, of course, there is only an implied obligation here. I don't quite understand

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his decision, but I don't think I will argue that, that is the law of the case.

However, plaintiff argued as to that point that of course the right to recover patents only arose in 1966, we did have an obligation to manufacture and market in 1965. Both parties agreed that we did have an obligation to manufacture and market.

They then argued, as your Honor knows from the memorandum that was submitted this morning, I think, that they contended that when the contract was entered into the device was fail-safe and marketable and that Singer breached that part of the contract by failing to market and manufacture, to which Judge MacMahon replied or held on the basis of repeated admissions by the plaintiff and by Mr. Perrino it was perfectly obvious that the device was not fail-safe, therefore it was not marketable, therefore we had not breached the contract.

Then he went on saying that neither party had addressed themselves to any such question, but that he thought or he said, "The best efforts, like reasonable care, is a term which necessarily takes its meaning from the circumstances."

Then he went on, "We think best efforts here under the circumstances means we had to collaborate in mak-

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ing the device fail-safe."

He thinks that is so because we didn't do a lot of work that we have been hearing here in trying to correct mechanical defects of the device. He thinks the fact that we did that, he thinks this shows an understanding of further experimental work.

Then he went on, as Mr. Grand has said, the factual issue, if any, is whether we did that.

He goes on and says:

"Neither party ever mentioned the subject to us, neither party has briefed it at any time. Therefore, I cannot make any decision. The whole thing has to be set forth and good judicial administration means that judgment of the ultimate questions involved in this case be withheld until there is a solid basis for findings by a court or jury based on litigation or a comprehensive statement of agreed facts. I can't make a decision until the whole structure stands solidly established at the trial."

Of course, for that reason he denied summary judgment. It is obvious that he is not making a binding decision. It does not require any authority as to the proposition if the judge says, "I think under the circumstances as I see them this is what the parties under-

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stood, but nobody has addressed themselves to it and I cannot make a decision," obviously that is not binding.

THE COURT: I am not suggesting that it is. All I am telling you is that I signed a pretrial order setting forth the issues in this trial. Those are the issues that we are trying here.

You spent an awful lot of time in this memorandum to convince me that the law of the case does not apply. All right, the law of the case does not apply as far as some other judge has found it. The law of the case does apply as I have found it.

All right?

MR. CHANLER: Yes.

THE COURT: The thing that does apply is that the issues were set forth. I don't know exactly how this fits in with the problem as to what Mr. Perrino's belief was to show intent and so on. That is not my problem at this point. My problem is I am trying to keep this case within the issues as defined and I intend to do just that.

MR. CHANLER: Your Honor, I don't think that Judge MacMahon's decision --

THE COURT: I don't care about Judge MacMahon's decision.

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MR. CHANDLER: -- is the law of the case.

THE COURT: I am not saying it is, but I am saying my decision in doigning that pretrial order is the way we are going to try this case.

If you would like to argue that my signing that pretrial order is improper, improvident or whatever, you can argue it, but I am afraid that you will have to go to our friends upon the 17th floor to get that decision.

MR. CHANLER: All I am saying, your Honor, is -- I don't know. If your Honor is following Judge McLean, Judge McLean said he is following Judge MacMahon and that is a question to be --

THE COURT: Strangely enough I am following Judge Duffy as to what I am trying to do here.

In the pretrial order I considered all of the prior decisions, I considered the arguments of both parties and I signed an order trying to delineate the issues and these are the issues we are going to try in this case. All right?

MR. CHANLER: Your Honor is holding than that under the contract Singer had an obligation to attempt to perfect the fail-safe problem?

THE COURT: I am not holding anything ~~that~~ but

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that I signed a pretrial order which delineates the issues. If you disagree with those issues, then you have your relief but your relief will come at the end of the case. We are going to try the issues that were set forth in that pretrial order.

MR. BENDOW: Your Honor, I don't want to extend this, but could I just add a word?

THE COURT: Sure, go ahead.

MR. BENDOW: Thank you, your Honor.

First of all, I would like to remind your Honor that I believe it to be the case, although I was not involved at that time, that this language that we are now operating under and that I think we are willing to operate under, I believe we should operate under, of the pretrial order was first incorporated in a pretrial order by Judge McLean, which came out of the pretrial conference to which Mr. Grand first referred and to which my partner, Mr. Chanler, has responded, and it seems to me that the reason that we find it in the McLean order, for whatever reason it appears in your Honor's order, was because McLean listened, had that argument and said that for then present purposes he was going to follow Judge MacMahon, not in a binding fashion, as I read it, and I thought that was the purport of his comment to

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Mr. Chanler at the end of the pretrial conference, that there was no need for an exception because he wasn't ruling that that was the law of the case, he was merely saying for present purposes "I am following my brother, MacMahon."

Your Honor, it seems to me perhaps you went through these processes that you have just referred to and this has been thoroughly litigated and aired by you and I certainly don't want to repeat it to you if your Honor has thoroughly considered it, but I really think you inherited that pretrial order, your Honor, as far as I have been able to tell from this record, and I have certainly never had the opportunity and I don't even believe Mr. Chanler, at least in any record -- we don't have any transcript of any pretrial conference that shows your Honor's thorough consideration of this question and I think it is too real a one. It is not, as Mr. Grand would have it, something that we are continually harping on and niggling words on, this is very substantive to the heart of this case and I think we have the better of the language of interpretation of the MacMahon and McLean statements on this point and I think Mr. Grand would like very much to have your Honor feel it was all previously decided and so forth and so on, but that the

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fact is every judge who has dealt with us, up until our your Honor, at least, has said, "Wait a minute. Postpone it, let the next pretrial judge" -- and most reasonably and I think Judge MacMahon was quite right about this, as my colleague Mr. Chanler has just stated -- "Wait for a full-fledged trial so we got all the pieces we need to decide whether this alleged obligation exists or not."

After all, the underlying obligation itself that everyone is agreed about is merely based on the Duff-Gordon rule, so what we are doing, in effect, is we are implying an obligation on an obligation which itself was only first implied because if you read the contract you don't even find Duff-Gordon stated in the contract.

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THE COURT: Come on, Mr. Benbow. You haven't seen the contract with a citation yet, have you, to a case, at least?

MR. BENBOW: I don't mean it in that sense, your Honor. I didn't make amy point clear. My point is this: If you look at the contract alone, in the absence of the Duff-Gordon rule, you would decide the contrary. The language of the contract doesn't eben put on Singer an obligation to manufacture and market. It is only by virtue of Duff-Gordon that you get to that result.

The effect of this interpretation of the pre-trial order that your Honor is suggesting he is going to follow would add yet another implied obligation on top of that implied obligation. In other words, we apparently satisfied that implied obligation of manufacturing and marketing, so now we have a question on top of that only implied obligation, should yet another one be added, that is, an implied obligation not only to manufacture and market, but when we go to manufacture and market, to perfect a device that was imperfectable and which the inventor has testified this morning was already perfect when we got it, except for problems of mass production, or whatever the phrase was.

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Your Honor, I think that given the contract and given what the previous judges have said on this and in spite of the fact that we have a pretrial order here that we are entitled to have your Honor's renewed and well-briefed consideration of this issue. I don't think that this memorandum --

THE COURT: Mr. Benbow, your problem is you are not trying at this point to get me to change the pretrial order, which I think is quite clear. What you are trying to get me to do is to decide the case.

MR. BENBOW: No, I am not.

THE COURT: Until I get the facts in I can't decide the case.

MR. BENBOW: No, I am not. I am just trying to find out whether --

THE COUR: That basically is it. If you want me to decide the case without hearing the facts it makes life a lot easier for me, I can speculate on it, but I prefer to get the facts in. All I tried to do in the pretrial order was to set up the issues. The issues I think are fairly simple there.

The thing is under those issues we will try the case, I will get the facts, I will decide those issues. If I am wrong in formulating the issues three weeks into

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the trial is a little bit late to start considering that. Those issues are the issues we are trying.

MR. BENBOW: I think the problem I am having, your Honor -- and I don't, as I say, wish to prolong this, but I do want to find out what our guidelines are, and this is very helpful to me in the further conduct of the case, if nothing else -- what I am trying to get at, when you say we are going to go ahead and get the facts or try these issues, is your Honor's understanding common with mine that implicit within the issues as framed is -- the issue as to whether this obligation to perfect existed at all? Because I believe it should be.

THE COURT: This memorandum is devoted to the intent of the parties when they entered the December contract. That is exactly what it is devoted to, not as to what we are discussing at this point. Therefore, we have gone away from this memorandum, is that correct?

MR. BENBOW: I am not clear that we have, your Honor, no. It may be so framed. I foresaw that there was going to be objection to some of the questions. There were objections to some of the questions that are raised. There appear to be continuing objections. Your Honor had doubt about them. So when the subject came up in the robing room I thought it

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appropriate to present this memorandum to you and I think it has been helpful to us at least to have this discussion now on the record.

However, I think we are very much into this memorandum because this memorandum, among other things, goes into this question of what is the effect of the pretrial order and its language.

THE COURT: The effect of the pretrial order is to pose the issues to be tried in this case. The reason for posing the issues in this case is to determine the relevancy of evidence to come in. That is the effect of it. All right?

BY MR. BENBOW:

Q I think just before lunch I was about to ask you, and I will ask you now, were products made from that design ready for market, Mr. Perrino?

A Were products made from that design ready for production, is that what you said?

MR. GRAND: I object.

THE COURT: Wait a second. I don't think he understands the question.

MR. BENBOW: He had testified that the design was perfect.

MR. GRAND: No, I don't think he did.

THE COURT: Don't go through that. Your question was were the products ready for market and Mr. Perrino said were the products ready for production. Which is it?

MR. BENSON: I thought I asked him, as Mr. Grand just stated, was the design ready for market, and Mr. Grand had objected to that on the grounds you can't market a design. I am now asking him if products made to that design were ready for market.

MR. GRAND: I don't know if there were any.

THE COURT: All right. Let's find out.

Were there such products?

A The product or the design was ready, in my opinion, to be put in mass production providing we took into consideration what happens in mass production.

had repeatedly stated that the product at all times was ready for mass production and was marketable and that the only perfection required was in Singer's manufacturing?

MR. GRAND: May I ask, your Honor, by way of objection what difference it would make if he had told his counsel that or not?

THE COURT: I have no idea.

MR. GRAND: The question is, did he tell it to Singer, not did he tell it to me.

THE COURT: I don't care about that. I will let him answer it.

A I think this is one of those paragraphs where I explained to Mr. Grand what was going on and this is reduced, this is reduced so that it needs an explanation now.

Q Evidently.

Mr. Pezzino, there is a reference in this paragraph to mass production and you have referred in your testimony today and previously to mass production.

Was there a time, Mr. Pezzino, when Pezma was its own manufacturer of the Pezma device?

A No.

Q No?

A You mean we made our own parts?

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Q You placed an order for 50,000 with Worcester, is that your testimony?

A Yes.

Q Was that an order for mass production?

A It was an order for 50,000 units, of which Worcester Stamped Metal was working with us or started to work with us on getting the product into mass production.

Q When was that order placed?

A I think near the end of 1963, if I remember correctly.

Q A time well prior to your first contact with Singer-Elizabethport, is that right?

A It was three or four months.

Q At page 877 you were questioned about the following statement:

"The Perma anti-skid control is a perfected, patented device proved and accepted by safety officials as well as automotive engineers and mechanics."

Let us take it piece by piece. To the extent that it refers to perfected, the Perma anti-skid control is a perfected device, what was the factual basis for that statement?

A Well, perfected I don't believe means perfect. Perfected, if I can give an example, when the automotive industry came out with the first automatic transmission it wasn't perfect but it was usable and workable, and when an invention is workable, usable and marketable this is what is referred to as perfected and this is what I believe that this word "perfected" means in this content.

MR. GRAND: They weren't part of the market. I hope you aren't --

THE COURT: Go ahead.

MR. BENBOW: The film is now being represented, it is being treated as if it were limited to whatever technical audience it may have had. It does not in any way demonstrate that it was merely referring to prototyped or preproduction samples or anything else, it is presented in that film as a consumer unit.

THE COURT: I have seen the film.

MR. GRAND: I don't know how Mr. Benbow knows to whom it was shown other than to Singer.

BY MR. GRAND:

Q There is the word in that statement "patented" and I gather the factual basis for that is the patents we introduced into evidence?

A Yes.

Q It also says the device was approved and accepted by safety officials.

Can you tell us what the factual basis for that part of the statement is?

A We gave a lot of demonstrations to safety officials. One in particular was to all the registrars of motor vehicles. They were having a seminar in

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New Hampshire and there were, I think, 50 registrars if there were 50 states and there were 200 people, including automotive safety engineers, and we demonstrated the product -- I think we had two automobiles there -- we demonstrated the product, explained it to them, many of them drove it. I have cards with their comments on it. And there were many, many engineers and registrars there.

Q You say it was accepted by them. What do you mean? What did that part of the statement mean?

A Well, when I say -- well, let eme go on to the rest of the people.

Travelers Insurance Company --

MR. BENBOW: I object. He should respond to counsel's question, it seems to me.

THE COURT: I think he is.

Go ahead.

A We demonstrated it and we gave units to engineers of Travelers Insurance Company and they wrote a policy for a million dollars on it, product liability policy on it.

We showed it to General Service Administration and they had people who drove it and tried it and took units.

We demonstrated for the National Safety Council, for the -- there were numerous people that have tried the unit, took parts, took the units and so on and their reaction was that they felt it was a good product. We got letters to that effect. So that's the basis for it.

Q Did Perma receive permission from any of the registrars of the 50 states to register vehicles with such devices on them?

A We have letters from almost all of them saying that the product was worthy of being used in one form or another and it did comply or did not comply, violated, all different forms of the letters saying that it could be used.

MR. BENBOW: I object to the on-going hearsay nature of these alleged letters that the witness is testifying to. No such letters have been introduced on this transcript and for him to remember what he is getting from 50 different states it seems to me to summarize a flow of hearsay that we should have to try to respond to unless it is proposed that these letters are going to be identified and marked on this record and I will have an opportunity to ask the witness about them.

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the wheels, release them, then reapply the brakes. This on-and-off braking cycle provides the quickest possible stopping on any given road surface, yet allowed steering control, thus preventing uncontrollable skids."

It is that portion of the statement, "This on-and-off breaking cycle provides the quickest possible stopping on any given road surface, yet allows steering control, thus preventing uncontrollable skids," that I want to direct your attention to and ask you what the factual basis for that statement was.

A Well, we knew the conventional brakes took a certain length of time to stop and when we developed the Perma-Vac and it stopped quicker we believed it to be the quickest possible stopping compared to anything we knew of related to brakes.

Q Do I understand you to be saying that you knew of nothing that could stop shorter at the time the statement was made?

A No. We knew there were standard brakes could stop at a certain distance and if we could stop shorter than that, that was the quickest possible stopping that ew knew of.

Q And I gather you believed that statement to be true at the time it was made?

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A Yes.

Q I gather, further, that that statement is not a theoretical statement but a statement in terms of quickest possible stopping distances available at the time?

A Yes.

Q Was the statement based on tests?

A They were based on a comparison of testing the unit with the anti-skid device on and a conventional braking system without the unit on.

Q Was the statemer based both on tests conducted by Perma and Motor Vehicle Research?

A Yes.

Q There is a similar statement at page 883 that your attention was addressed to:

"In all cases well beyond the usage of any motor vehicle the Perma anti-skid control unit proved its longevity, proved its dependability, proved that it not only prevents uncontrolled skidding, but stopped a car in a shorter distance."

Directing your attention to that portion of the statement which says, "proved that it prevents uncontrolled skidding, but stops a car in a shorter distance," am I correct that your answers would be the

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THE COURT: Mr. Benbow, have you seen Exhibit 120?

MR. BENBOW: It was just handed to me and I am just looking at it, your Honor.

THE COURT: All right.

MR. BENBOW: No objection, your Honor.

(Plaintiff's Exhibit 120 was received in evidence.)

MR. GRAND: I would like, your Honor, to call your attention to the first paragraph andthe last paragraph on page 4, specifically that portion concerning whether or not the investment appeared to be an attractive long-term diversification for Singer.

THE COURT: Would somebody be good enough to identify for me who Mr. D. D. Marsden is and who Mr. R. S. Torello is, if you know? You don't have to do it today.

MR. BENBOW: They are both employees of The Singer Company, your Honor.

MR. GRAND: I think located in the New York office.

Is that correct?

THE COURT: All right.

MR. BENBOW: They are both in the controller's

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office, I believe.

THE COURT: It looked like it, but I wasn't sure.

MR. GRAND: You may recall, your Honor, that there was a memorandum I think in August of 1965 --

MR. BENBOW: I don't think Mr. Grand should volunteer this.

THE COURT: All right.

MR. GRAND: I am advised by Mr. De Rensis, your Honor, that during the course of the depositions of the Singer people we were told that Mr. Marsden was the corporate controller for Singer in the New York office and that Mr. Torello was on his staff.

THE COURT: It is the same thing. Two guys from the controller's office.

BY MR. GRAND:

Q By the way, Mr. Perrino, did Mr. Canning of William Hill tell you the purpose for which he was seeking information from you and Perma?

A No, I don't believe he -- I complied with Mr. Cloby's request to hgive him information. I wasn't sure exactly what he was going to do with it at that time.

Q You didn't know what he was going to do with that information?

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time to time when I done work with him.

Q You say not in cash. Were you paid by some other method?

A Yes. I was paid in Perma Research stock.

Q Did there come a time when you visited Motor Vehicle Research of New Hampshire?

A Yes, there was.

Q When was that?

A Oh, that was in 1963. I would say mid-summer, late summer.

Q On how many separate occasions did you visit Motor Vehicle Research?

A I made two visits there.

Q Can you tell me when in time the second was?

A The second?

Q When in time was the first? I think you siad it was mid-1963.

A Mid-1963, mid-summer or late summer.

Q When was the second visit?

A Several weeks later.

Q Would you describe your first visit to Motor Vehicle Research?

A The first visit was with Frank. Frank asked me to go with him to Motor Vehicle Research as he was to go up

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MISS TAYLOR: I object.

THE COURT: If he knows. Go ahead. Answer it.

THE WITNESS: I don't quite understand now.

THE COURT: The question is do you know what the results of the tests were that you observed.

A I don't know what the results of the tests were because the tests were still running.

THE COURT: All right. He doesn't know.

Q Did you see any units fail while you were there?

A I did not --

MR. BENBOW: I can't hear the question.

THE COURT: The question was did you see any units fail while you were there.

MISS TAYLOR: Objection.

THE COURT: I will permit it. Yes or no.

A No.

THE COURT: Look, let's everybody in the courtroom pretend that this place is very spacious and packed with people and you want to have everybody hear every blessed tone that you utter. Keep your voice up.

Q Tell us about your second visit to Motor Vehicle Research of New Hampshire.

Q I was up to Perma one day and Bob Mainelli asked --

MR. BENBOW: Your Honor, shouldn't counsel ask

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the witness questions instead of invite these narrative histories, tell us what you want to tell us?

MR. GRAND: Can we have one lawyer speak at a time back there?

THE COURT: Are you objecting to the question?

MISS TAYLOR: Yes.

THE COURT: Overruled. Answer the question.

A Mr. Mainelli asked me if I would go with him to the Motor Vehicle Research because he had to witness --

THE COURT: No, no. I don't care what he said. You went up there with Mr. Mainelli at some point, right?

THE WITNESS: Yes.

THE COURT: All right.

Q What kind of tests did you observe?

A We observed road tests.

Q How long were you there?

A I was there two days.

Q Was there a test vehicle?

A There was a test vehicle.

Q Would you describe the test vehicle?

A The test vehicle was a 1963 or 1962 Chevy Impala.

Q Did it have instrumentation on it?

MISS TAYLOR: Can you be more specific, Mr. DeRensis?

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THE COURT: I think you better be, because if the answer is yes it could have a speedometer, oil gauge, you know. Let's get down to what we are interested in. Lead him.

Q Was the car equipped with devices to measure stopping distance?

A Yes, there was.

Q Could you describe those devices?

A There was a fifth wheel with a speedometer from the fifth wheel inside the car.

THE COURT: Did it have an odometer on it also? Do you know what an odometer is?

THE WITNESS: Odometer? I don't, your Honor.

THE COURT: That is the thing which shows you how far you are going. In other words, the mileage indicator in your car right in the middle of the speedometer.

THE WITNESS: I know what that is now, yes.

THE COURT: That mileage thing is called an odometer.

THE WITNESS: I don't know if it had that in it or not, your Honor.

THE COURT: You don't know. All right.

A It had detonators attached to the front bumper and it had a detonator mechanism attached to the back bumper,

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it had a fifth wheel, again, the fifth wheel with the speedometer attached, it had a timing camera attached to the rear bumper.

Q Was there a test track?

THE COURT: He is not finished.

A There was also a board set up next to the driver with on and off buttons and a tabulating board.

Q Was there a test track?

A There was.

Q Would you describe the test track?

A The test track was at a local airport and along the edge of the airport I noticed a fence about 18 inches or 24 inches high and it ran along the edge of the airstrip approximately four to five hundred feet.

On this rail there was numbers numbering from 1 to 4, 500 and a smaller digit at the half-inch mark -- at the half-foot mark, I'm sorry.

Q Do you know how the detonators worked?

A The detonators worked that when --

Q Do you know how they worked?

A Well, I knew how it worked in that car, yes.

Q Would you describe how they worked?

A As the car was moving and the application of the brake was applied, the moment the brake was applied the shot

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would go off in this detonator, therefore shooting a yellow cylinder of chalk onto the road surface.

MISS TAYLOR: Is this based on your observation or your knowledge of detonators?

THE COURT: I don't know. You can ask him on cross-examination, but not now.

Q Was there more than one detonator?

A Yes. There was one on the back bumper and one on the front bumper.

Q How did the front bumper detonator work?

A The front bumper was shot off when the car came to a rest, when it came to a dead stop. When the car was stopped the front detonator went off.

Q Do you know how the timing camera worked?

A The timing camera would be flipped on as it approached the rail at the No. 1 figure.

Q And it would take pictures of the rail?

A It would flash on. I noticed the flash of the camera going on when it approached the rail, and then it would continue reading the rail.

Q Was there a light on the camera?

A Yes, there was a flash on the camera.

Q And this light flashed as the car moved?

A This flashed -- when the technican flipped on a

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switch it would flash the bulb in the camera, therefore blowing out the bulb, and the camera would be running.

Q Did you observe the particular Perma anti-skid device on the test vehicle?

A Yes, I did.

Q From that observation canyou tell us what generation of Perma anti-skid device it was?

A It was a preproduction model.

Q How many separate stopping tests were run that day?

THE COURT: Wait a second. Don't answer the question.

It is my memory, at least, that he was there the second time and stayed for two days.

MR. BENBOW: That is my recollection, too, your Honor.

MR. DE BENSIS: Let me withdraw the question.

Q How many runs took place each day approximately?

A I would say in the vicinity of 50 runs per day.

Q What was done between runs to the automobile?

A Well, what I observed, after each and every run the vehicle would run out to the end of the airstrip and back to the approach of and for the next run.

Q How long was that in time?

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A Oh, I would say a minute, minute and a half, two minutes.

Q What speeds were the runs made at?

A The speeds were made at 20, 40 60 and 80, I believe.

MISS TAYLOR: I object. It has not been established that Mr. DiBenedetto is an expert on the speeds of moving vehicles and I don't see any foundation for his knowledge of the speeds of these vehicles.

THE COURT: I will permit it.

Q What were the results of the tests that you personally witnessed on both days?

A The results of the test?

Q Yes.

A What I observed, with the anti-skid on the results were shorter than with the anti-skid off.

Q In all cases?

A In all cases.

Q Did you see any test with longer stopping distances with the Perma anti-skid device on as compared with runs with the anti-skid device off?

A I seen no short with the anti-skid.

THE COURT: I am afraid the witness is confused.

THE WITNESS: I am, your Honor.

THE COURT: You saw all these tests in two days?

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THE WITNESS: Yes, your Honor.

THE COURT: You know that some of the tests were with the anti-skid on and some with it off, right?

THE WITNESS: Yes.

THE COURT: When the anti-skid was on, did you see anywhere the stopping distance was longer than when the anti-skid was off?

THE WITNESS: There was no longer stopping distances.

THE COURT: That is what we want to know.

BY MR. DE KENSIS:

Q What kind of road surfaces were tested?

A It was dry test and wet test and also steering control test.

THE COURT: Steering control is not a road surface.

THE WITNESS: I'm sorry.

THE COURT: Mr. DiBenedetto, my guess is that you are not a professional witness that comes into court all the time.

THE WITNESS: Never been in court.

THE COURT: Please, do me a favor. Listen to the question.

THE WITNESS: Yes, your Honor.

THE COURT: We are not trying to trick you.

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Listen to the questions and answer.

Go ahead, Mr. DeRensis.

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Q When you say dry you mean what kind of road surface?

A It was asphalt.

Q And when you say wet would you describe what you mean by a wet surface?

A Well, it was asphalt. There was a local Fire Department up there that wet the surface down under the wet test.

THE COURT: In other words, they hosed down the area, the same asphalt?

THE WITNESS: Yes, the same asphalt was wet down by the local Fire Department.

Q What happened at the end of the first day?

A The car was driven --

MR. BENBOW: Objection.

THE COURT: No, no, I will permit it.

What happened at the end of the first day?

THE WITNESS: The car was driven to one of the local filling stations there and the brakes were changed and new tires were put on.

THE COURT: And also fill it with gas.

THE WITNESS: And also fill it with gas.

Q What happened at the end of the second day?

A The end of the second day Bob Mainelli and

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FOLEY SQUARE, N.Y., 10007 TELEPHONE: [illegible]

I were talking. Bob told me he would like to try the vehicle at a very high speed, at 100 miles an hour.

Q Who is Bob?

THE COURT: Bob Mainelli.

A Bob Mainelli is the fellow who worked for Perma Research.

Q Who worked there in the past or who works there now?

A Who worked for in the past.

THE COURT: All right. So he said he would like to try the car at 100 miles an hour.

Did you?

THE WITNESS: Yes, he did. He drove the car.

THE COURT: Were you in the car then?

THE WITNESS: No, I was not.

THE COURT: I don't blame you.

BY MR. DE RENSIS:

Q Did you observe it?

A I observed that particular run.

Q What happened?

A The car, as soon as he put on his brakes, he locked the car up and the car started to pulsate all the way to a stop.

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THE COURT: Did it skid?

THE WITNESS: It did not skid out of control.

Q Did you observe any steering control tests?

A Yes, I did.

Q Would you describe those?

A The steering control tests were -- I should say were set up with two pylons probably set probably t 10 feet on centers so the vehicle can drive through it and another pylon directly in the center of these pylons, oh, I'd say anywhere, 50, 75 feet, something like that, and there was, I think, six runs at that particular, and that was called the steering control, working on steering control.

There were six runs, three with the unit on and three with the unit off.

With the unit on the car would pulsate and also was able to steer away from this pylon that was in front of the two pylons as you drove through.

The three units, the three times with the unit on the car pulsated away from that pylon in the center.

With the unit off the car would skid, even though the driver was steering away from the unit,

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the car would skid right toward that pylon.

THE COURT: I think this would be an appropriate time to break for lunch.

All right?

MR. DE RENSIS: Yes.

THE COURT: Be back at 2.

(Luncheon recess taken.)

THE COURT: No, I will permit it.

MR. BENBOW: Your Honor, I think it ought to be pointed out that the witness about whose statements he is testifying was on this stand for a month and I don't believe he was ever asked to say what he said at that meeting.

Now we are getting the second-hand version from someone else who didn't say it.

MR. GRAND: That is not true. He testified at length about this meeting.

THE COURT: Would you please.

Go ahead.

A He then invited the Singer people --

THE COURT: "He" being Mr. Perrino?

A Again, Frank Perrino invited the Singer people to the engineering department, where there were units simulating on and off and also units running at constant speeds.

Q You mean on test stands?

A On test stands.

Q Continue.

A He then asked Mr. Mainelli to set up a test track, meaning soak down a portion of the anti -- set up a portion of the road so the anti-skid unit could be tested with a vehicle.

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Mr. Mainelli then set up the track, soaping down an area of the track. The car was ready.

Mr. Mainelli reported back to Frank, telling him everything was ready for the test. Mr. Perrino then went out to the track.

THE COURT: Did you go with him?

THE WITNESS: I was there.

THE COURT: All right.

Q Did the Singer people go with him?

A The Singer people were there along the side of the test track. There were runs made at 20, 40 and 60 with the unit on and with the unit off.

With the unit on at each run, the car came to a straight controllable stop.

With the unit off, the car skidded out of control each time that it came down, which was three different tries.

The tests were completed. Mr. Perrino asked the Singer people if they wanted to drive the vehicle for themselves. They in turn said they were happy with what they seen, there was no need to drive the vehicle.

MISS TAYLOR: Your Honor, I would like to object to this continuing narrative form of testimony.

I think it would be more beneficial if we could

THE WITNESS: Mr. Morris.

A They then in turn gave Frank a couple of circulars.

THE COURT: You mean Mr. Morris gave them.

A Mr. Morris handed Frank two circulars.

Q Can you describe --

A One was a circular of quality control, engineering, another was a financial statement.

THE COURT: Your voice is dying out again.

A One was a circular referring to quality control, engineering, and taking a product from prototyping to mass production, and also a financial statement.

Q Of whom? Financial statement of whom?

A Of the Singer Company.

Q Anything else happen at that meeting?

A Oh, I guess that was about the end of the evening, the end of the afternoon.

Q Was Singer in fact given three units?

A Yes, they were.

Q What was said on the subject of Singer's engineering and quality control?

A They said --

MR. BENBOW: Objection, your Honor. I thought we just heard that nothing more happened.

THE COURT: I will permit it. 2137

A They did say, meaning either Mr. Morris or Mr. Kloby, that they would put the engineering, quality control and moneys, if need be, into this program.

THE COURT: Mr. DeRensis, is this an appropriate point for a five-minute break? I want to talk to Mr. Benbow and Mr. Grand.

MR. DE RENSIS: Sure.

(Recess)

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Q I would like to show you Exhibit 18A in evidence and ask you if this was given to Mr. Perrino at the meeting you just testified about.

A It looks like it.

Q You mentioned two meetings. Could you tell us when the second meeting was?

A The second meeting took place at Perma in late April, early March, when Mr. Kloby visited Perma.

Q Who was in attendance at that meeting?

A Mr. Perrino, Mainelli, myself --

MR. GRAND: Keep your voice up.

THE COURT: And was Mr. Kloby there also?

THE WITNESS: Kloby.

THE COURT: Was there anybody else?

THE WITNESS: And Mr. Sprague.

Q Canyou tell us what happened at this second meeting, what was said?

A He was explaining --

THE COURT: No, no.

A By "he," Mr. Kloby was explaining to us that they were installing one of the unitsthat was given to them at one of the previous meetings and as they were installing the unit the elbow at the back of the Perma-Vac broke off on installation.

A Until a short time ago it was an indepdent New York Stock Exchange Company. It was recently merged with the Fruehauf Corporation, I presume is what Fruehauf is.

When I was --

Q Before you go into that, can you tell me what business Kelsey-Hayes is in?

A It is a diversified business with the largest division is the automotive division, responsible for the manufacturing of wheels and brake systems primarily again for passenger cars.

Q Does that company supply automotive parts or components to the original equipment segment of the automotive industry?

A Yes, it does.

Q Any particular customer that Kelsey-Hayes has?

A Well, all the major manufacturers, primarily I believe to the Ford Motor Company.

Q And during what period were you a consultant for Kelsey-Hayes?

A At various levels beginning from 1967 through 1971.

Q Can you tell us when you were first retained

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as a consultant by Kelsey-Hayes what you were hired to do?

A I was initially requested to help the company make a electronic control module that controlled skid control operation ready for production.

Q And can you tell me when, if ever, Kelsy-Hayes first marketed an anti-skid control system for automobiles?

A To the best of my recollection, it was introduced on 1969 models that were in the market place at the latter part of 1968.

Q And can you tell mewhat cars it was introduced on?

A I believe on the Lincoln and Thunderbird vehicles.

Q Some time in late 1968?

A To the best of my recollection, yes.

Q In general terms, can you tel. us what activity wi respect to that anti-skid system was taking place at Kelsey-Hayes at the time you becam a consultant in early 1967 until the time that the product was marketed through Ford in lage 1968?

MR. BENECW: Your Honor, if he is to respond on this, can we have it clear as to what he is telling

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and then evaluation of the results of those modifications, at the same time an effort to get various parts of the system ready for mass production.

Q Can you tell us what role you played in those various functions or activities that Kelsey-Hayes was engaged in from the time you went to Kelsey-Hayes until the time that the product was marketed through Ford Motor Company in late 1968?

A My initial role was to try and assist the company in determining what would be the most advantageous way to produce the electronic control module for the skid control system.

Even though at the time the unit was a functioning unit, it initially required a total system evaluation and upgrading and changing of that unit so that performance would be more in line with what we determined performance ought to be.

As a result of the fact that the electronic module served as the controlling parameter of the system, my function became that of what you might call assistant coordinator to make sure that the trade-offs between the various parts of the system were compatible.

As a later date in 1967 the director

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of engineering and research, who at the time was also responsible for the skid control program, left the company and I was asked by Mr. Hayes, who had the overall responsibility for the operation, if I would be willing to take over the responsibility for the project.

At Kelsey-Hayes, as you mentioned earlier, I was only consultant and we have made a determination some months ago that we weren't willing or anxious to move to Detroit --

Q By "we" you mean your family and you?

A My family and I.

So I begged off and told Mr. Hayes that I would rather remain as a consultant.

He then asked me if I would be willing to take over the responsibility for the project on an interim basis until he was able to hire a new director, and I agreed to do so.

Q And for approximately how long were you assigned total responsibility for the anti-skid control program?

A A number of months. I'm not sure exactly. Three or four months, give or take a few weeks.

Q And thereafter was that role assumed by a man named Riordan, R-i-o-r-d-a-n?

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A Yes, it was.

Q Adn what role did you have as a consultant from that point on?

A Well, for aperiod I was assigned the responsibility of effecting the orderly transfer of responsibility, at which point, as the result of varying commitments, I only remained as part-time adviser on both reviewing other concepts of other people in the area of skid control and actually other advanced automotive developments, again doing this directly for Mr. Hayes, remaining available to Mr. Riordan at various times.

MR. BENBOW: Your Honor, since the witness seems to have finished that answer and I don't know whether Mr. Grand intends to pursue some parts of that answer or not, but I would like to note my continuing objection, even though this is an expert witness, to the presence of Mr. Perrino and of Mr. DiBenedetto and if there is any change that either of them would be called again on Mr. Grand's redirect case.

THE COURT: I don't believe so. Your objection is noted. Go ahead.

How long of an introduction can you make this?

MR. GRAND: I can stop now, your Honor, if

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that would suit the court, because there is more.

THE COURT: All right, let's have it.

MR. GRAND: Perhaps I should clarify.

To some extent this is not simply introduction either, as it relates to the development of an anti-skid device. I think that can provide a factual basis for certain inferences.

THE COURT: All right.

Mr. Goor, have you ever appeared as an expert witness at any time prior to this?

THE WITNESS: No, I have not.

THE COURT: There has always got to be a first time.

THE WITNESS: I am very nervous I must say.

BY MR. GRAND:

Q During the period that you were a consultant to Kelsey-Hayes did you become fully familiar with the Kelsey-Hayes anti-skid system that was marketed through the Ford Motor Company in late 1961?

MR. BENBOW: Objection, your Honor.

THE COURT: It is a question that kind of answers itself.

Go ahead, answer it. Did you become fully familiar with it?

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here he is testifying about fooling units.

I really think that on several grounds this is an objectionable line of continuing testimony in light of the limited qualification to date of this witness.

THE COURT: We will let him continue, though.

Go ahead.

Q To your knowledge, sir, did the system as it was introduced through the Ford Motor Company in the fall of 1968 have any fail-safe mechanism?

A Well, inasmuch as the system operation was to by-pass the driver in case of a skid and displace fluid by means of retracting the diaphragm, the system was designed to detract when fluid is displaced for a period beyond a prescribed amount and then cut the signal to the system off.

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MR. BENBOW: Your Honor, I move to strike that answer. We are now getting his definition of what fail-safety is, but he has not been qualified yet to express such an opinion.

THE COURT: I will permit it.

Q Can you tell us how that operation was achieved?

A Well, I cannot go into proprietary devices, but there are any number of switches that can detect proximity, for example, thermo switches or vacuum switches, that will not act until a set period of time have gone by. That's the type of switch that was used in the system.

Q Was the switch that was installed in the Kelsey-Hayes system designed to overcome hydraulic leaks in the system?

A It was only designed to detect when a system was displacing fluid from the rear brakes for a period beyond a prescribed amount of time.

Q So the answer to my question, I gather, is no, it was not designed to overcome hydraulic leaks?

MR. BENBOW: Objection, your Honor.

THE COURT: I will permit it.

A That's right.

Q Was it designed to detect other malfunctions which

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did not cause the displacement of brake fluid beyond the preset period you referred to?

A Only inasmuch as --

THE COURT: Wait a minute. Read the question back, please.

(Record read.)

A No.

THE COURT: The answer is no?

THE WITNESS: Yes, your Honor.

Q You testified at page 2303 in response to my question, "During the period that you were a consultant to Kelsey-Hayes, did you become fully familiar with the Kelsey-Hayes anti-skid system that was marketed through Ford Motor Company in late 1968?" You answered, "As fully familiar as one in my position could, yes."

Could you elaborate on that?

MR. BENBOW: I object, your Honor.

MR. GRAND: I thought you objected because I didn't qualify him.

THE COURT: No, I will accept it.

Go ahead, tell us what you did.

A Well, in my position, I was responsible for quite a few things in the system and I was not familiar with detail, hardware details in the system, more familiar with

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others.

THE COURT: What did you do?

Q Will you describe what you did, what your familiarity was?

A Performance systems responsibility and at the end I was in charge of the total system, therefore, I was not involved in the details of some of it.

THE COURT: When you get involved in the performance system, what do you do?

THE WITNESS: You examine systems operation, you are witnessing and sometimes take place in vehicle stops, you are made aware of all the tests that run, any changes in line of what various components the system should do, not necessarily what they do but how they should function, and how that affects the total system performance.

MR. BENBOW: Could we hear back your Honor's questions and the answers thereto?

THE COURT: Yes.

(Record read.)

Q From the time you became a consultant in early 1967 until the product was marketed, were you familiar with the various stages of design and development that the Kelsey-

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title, but I had that responsibility for the skid control program at that time.

Q And when, if you could pin down the date, Mr. Goor, did you cease to act as the acting director of research and development?

A Shortly after Mr Riordan was hired, which was some time later. I don't know what the date was.

Q When?

A I have no specific recollection of the date.

Q Mr. Goor, it isn't that long ago and I assume that was a rather major position for you. Could you try to nail down the date?

A I'm afraid even though it might have been a rather major position for me, it was done on a temporary interim basis and I don't recall the dates specifically.

MR. GRAND: He already testified on direct, as I recall it, it was three or four months.

A It didn't matter --

THE COURT: All right.

Q After Mr. Riordan came into the employ of Kelsey-Hayes, I believe you testified that you advised Kelsey-Hayes on a part-time basis?

A Well, initially it was almost full-time. I shared offices with Mr. Riordan for some time.

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Q And you helped Mr. Riordan acquaint himself with the company and the product and so on, didn't you?

A Yes, I did.

Q How long did you do that?

A Again, I have no specific idea.

Q A week?

A No, it's more like weeks, but how many, eight, six, nine, I really don't know in that specific function.

Q And after you had finished briefing, as it were, if I may use that characterization, Mr. Riordan, you then advised Kelsey-Hayes on a part-time basis?

A Yes, I did.

Q During this time I believe you were working for Mr. Hayes, were you not, directly?

A Primarily, yes, sir.

Q And you did not work for Mr. Riordan?

A No, I did not.

I did initially, but then I did not, that's correct.

Q And Mr. Riordan had the responsibility for the engineering of the Kelsey-Hayes anti-skid device?

A Yes, he did.

Q Did your part-time consulting services from this point forward consist in the main of reviewing anti-

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skid concepts of other corporations and entities?

A To some degree.

Q Would you say that that was the major part of your effort?

A I suppose you might say that.

Q Incidentally, Mr. Goor, you didn't have any association with anti-skid devices before the latter part of 1967, did you?

MR. GRAND: I object to that.

A The early part of 1967.

THE COURT: Is the answer you first became involved with anti-skids in the early part of 1967?

THE WITNESS: Yes.

MR. GRAND: He testified it was in the early part of 1967.

THE COURT: That's what he said.

Q Very well, in the early part of 1967, but prior to the early part of 1967 you did not?

A Not as such, no.

Q But in 1968 you commenced a study for Hayes of other anti-skid concepts?

MR. GRAND: He hasn't testified, as the implication appears to be, that he did that tothe exclusion of working on the Kelsey-Hayes anti-skid.

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Q Was Kelsey-Hayes producing the unit in January of February, 1968?

A That was around the date that the unit was introduced or was actually frozen into production.

Q It was brozen at that time, sir?

A Please understand the meaning of frozen.

Q What do you mean by frozen?

A The basic design is frozen for production, not excluding some required changes either to facilitate manufacturing or, if need be, minor changes that can be done within the production parameters to incorporate some new findings that may help the system.

Q Can you tell us when the design of the production design of the Kelsey-Hayes system was accepted by Ford Motor Company?

A The early part of 1968.

Q And at that time it was frozen?

A Inasmuch as we freeze design at that stage, yes.

Q Canyou tall me when the system went into

production?

A It started shortly after that date. I am not too sure what the specific date was. Enough to allow for '69 year introduction.

Q What is the consequence of preventing the rear wheels from locking up?

A Well, it does two things. It makes the direction of wheel rotation the path that is easiest for the wheels to follow and they will follow it.

It also, by having relative motion of the wheel to the vehicle, it introduces improved braking in every wheel at the same time.

Q How is that?

A Well, when the wheels go at a proportion of vehicle speed empirically the numbers vary.

If they go at a speed that is -- different people use different speeds, but at a speed approximately 60 to 90

per cent of the vehicle speed they initiate improved braking, and therefore by keeping the wheel sliding at rates in that general area you also get improved braking in the wheel in addition to maintaining the directional stability that the vehicle goes.

THE COURT: Wait a second. You used the word keeping the wheels sliding. You mean sliding or turning?

THE WITNESS: Turning. I am sorry.

Q Is that in part because if the wheels of the vehicle are rotating there is friction being generated between the brake shoes and the brake drums and that friction is a method of absorbing some of the kinetic energy?

A In part this is a part of the increase. The increase proportion naturally is larger when the road coefficienc is very low, so that the sliding or the skidding only allow for a limited amount of energy absorption.

Q That is the tire to road friction on a low coefficiency of friction surface would allow for only a relatively small amount of absorption of the kinetic energy?

A That is correct.

Q And if the wheels are allowed to rotate to some degree some of the energy then would be absorbed in the brake lining?

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A That is correct.

MR. LAGEMANN: Your Honor, I would like to object at this point to Mr. Grand leading his own expert witness with expert questions.

THE COURT: That is all right.

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Q When we last appeared you testified that during the course of the development of the Kelsey-Hayes system that was introduced on Ford motorcar vehicle's criteria for marketability were developed, that you were familiar with them and that you participated in the development of those criteria.

MR. LAGEMAN: Do you have a page, Mr. Grand?

MR. GRAND: That is 2328, I believe.

Q Can you tell us what those criteria were?

A Well, the first criteria that was established was that under panic conditions the vehicle should maintain directional stability in --

Q Under panic conditions, that is, when you slam the brakes on?

A When you slam the brakes on that you maintain directional stability during the stops. This is to say in general terms, stay within the equivalent of one lane of traffic during panic condition stops.

Q Were criteria or was a criterion developed concerning stopping distance of a vehicle with an anti-skid device as opposed to with locked wheels?

THE COURT: We are talking still about Kelsey-Hayes?

MR. GRAND: That is correct.

THE COURT: All right.

A Yes. The basic criteria that was established

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that a vehicle with the device on normal road conditions, leaving out such things as very loose gravel, loose snow, or some other uncommon condition, that the stopping distance with the device on should not appreciable loose under any of these conditions to break wheel stop, a lock wheel stop.

THE COURT: I am not sure I understand that.

MR. BENBOW: I certainly don't.

THE COURT: When you say that it would not lose in a lock wheel stop you mean that it would not be greater than a lock wheel stop?

THE WITNESS: Not appreciably anyhow, yes.

THE COURT: Not appreciably.

THE WITNESS: Yes.

THE COURT: But did the criteria permit some extension of stopping distance with the anti-skid device as opposed to the locked wheel stop?

THE WITNESS: Yes. it did.

THE COURT: All right.

Q Was there a difference in the criteria for stopping distances with respect to high coefficient of friction surfaces as compared with low coefficient of friction surfaces?

A Not so much in a formal criteria, but it was accepted for various reasons that on a high coefficient

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of friction road, where the tendency to skid is less and your stopping is quite good with locked wheels, that loosing somein stopping distance in those high coefficient roads would be less harmful than on low coefficient roads, and the goal was, and general criteria, that on lower coefficient roads the improvement in stopping distances should be more consistent and appreciable than it would be on a high coefficient road.

Q Areyou saying that one can expect improved stopping distances with an anti-skid device on low coefficient friction surfaces?

THE COURT: Are we still talking about the criteria for Kelsey-Hayes?

MR. GRAND: Yes.

A Yes, I would say that one can expect more consistent improvement on roads with low coefficient than roads with high coefficient, where you may at times loose slightly in stopping distances to locked wheels.

Q To come back, the question was during the development at Kelsey-Hayes when you were working towards criteria and guidelines for a marketable anti-skid you testified that the criterion was that there should not be appreciably greater --

A Yes.

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Q -- stopping distances with the device than without it?

A Yes.

Q Does that hold true for low coefficient of friction surfaces as well or was there slightly different criterion for low coefficient of friction surfaces?

A Well, the criteria was for the whole range, but the goal was for low coefficient of friction to consistently get improved stopping distances.

Q Were there also criteria developed concerning the performance of an anti-skid device in the automotive environment?

A Yes. The unit had to be designed so that it could function under the total range expected in the automotive environment where the unit is to be installed.

Q And that range consists roughly of what?

A Well, it includes various temperature ranges that one may find across various places where cars are driven, it consists of whatever fluids that may be spilled on units while people work on cars, which could include gasoline, brake fluid, oil, or whatever it could include, such things as salt thatis put on icy roads in the wintertime that may splash on the unit, the shock and vibration encountered in a vehicle, and so on.

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Q Were there criteria developed concerning reliability of an anti-skid device?

A The basic criteria for reliability was two-fold: It had to function without failures within warrantee periods, or at least, with a good knowledge of statistical probability, that had to be quite low, within a warrantee period of a car.

Q You said it was two-fold.

A Well, inasmuch as it had to do with braking systems, it had to be quite reliable within that period.

MR.LAGEMAN: May we have that answer, the last part read back?

THE COURT: Sure.

(Answer read.)

Q Were there also criteria relating to when such a system should become activated?

(No response.)

Q That is, the conditions under which such a system should become activated?

A Yes. The system should have not been activated unless -- essentially only when an impeding skid was detected.

THE COURT: Impeding or impending?

THE WITNESS: Impending. I'm sorry. Impending skid

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was detected.

Q What is the qualification that you are expressing by the word "essentially"?

A Well, there are some conditions under which a unit may function. They are very limited, but, again, it is a function of the setup of measure of wheel deceleration that can sometimes be bypassed either accidentally or purposely.

But it should be essentially only -- it should essentially only function when an impending skid is about to take place.

Q Is the word "essentially" meant to cover the situation that you testified to earlier, about fooling the unit?

A I would say so, yes.

Q Were there also criteria concerning the effect of an anti-skid on other systems within theautomobile?

A When the skid control functions, it should have no effect on other systems of the vehicle.

Q Such as what other system?

A Such as the electrical system on which it drew, the vacuum system on which it drew, et cetera.

Q What about fail-safe? Was there any criterion relating to fail-safe or fail safety?

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A Well, inasmuch as a main function of skid control is to displace and reapply brake fluid, or in other words to release and reapply brakes, a fail-safe criteria to monitor this function was established, and it was established in a way that if such function exceeded an acceptable or reasonable period of time, then the system is to bypass itself.

Q You say "such function." I assume you are referring to the displacement function.

A Yes, I am, to the release of brakes for an unreasonable period.

THE COURT: Tell me, was there also a criterion in connection with the amount of displacement?

THE WITNESS: It was set primarily on a period of time, as the displaced differential on different surface conditions.

BY MR. GRAND:

Q Can you tell us what you mean by bypassing?

A Well, to allow the vehicle braking system to functionwithout skid control in operation.

Q Now, these criteria that you testified about, do I understand correctly that they were developed at Kelsey-Hayes in conjunction with the Ford Motor Company?

A Mostly so, yes.

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Q Were they also developed in conjunction with consultation and dealings with other automobile manufacturers?

A Yes, they were.

Q Can you tell us what other automobile manufacturers were involved in the development of these criteria, or had input into the development of these criteria?

A Well, we had lengthy discussions and meetings and installations with people from other automotive companies, such as General Motors, Chrysler, some with American Motors people, International Harvester. I would say these are the key inputs that I recall.

Q Now, based on your experience that you have described at Kelsey-Hayes in the development of these criteria, is it your opinion that an anti-skid device which satisfies those criteria would be marketable generally in the automobile industry?

MR. GENBOW: Your Honor, I object to that. It seems to me it goes beyond the areas that you permitted when I raised my objection at our last meeting, and that is why I am rising on this occasion. It seems to me I argued that point and I wanted to make that objection.

THE COURT: Okay. But I will permit it.

Go ahead.

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A At that time, from the feedback we had from various manufacturers, I feel thatthis would have been an acceptable marketing criteria.

BY THE COURT:

Q Let me go one step further. Was the Kelsey-Hayes unit designed and manufactured to meet these criteria?

A Yes, it was.

Q And was it marketed?

A Yes, it was.

THE COURT: Okay. Go ahead.

BY MR. GRAND:

Q Have you evaluated the Perma anti-skid system?

A Yes, I have.

Q And in that connection, have you examined --

MR. BENBOW: Your Honor, the question is so vague as to --

THE COURT: Hopefully we are going to get more specific now.

MR. GRAND: That's right. It was a general introductory question.

THE COURT: All right. Go ahead.

BY MR. GRAND:

Q In that connection, have you examined the various patents which comprise Exhibits 8 through 13 (handing)?

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MR. BENBOW: While he is looking at those, your Honor, I would just point out that in their issued form, all but the first of these patents, as I look at them quickly were issued after the events which are in question in this litigation.

THE COURT: Okay.

A Yes, I have.

THE COURT: So noted.

MR. GRAND: So that the record is clear, your Honor, it should also reflect that thepatents were applied for between 1956 and November, 1964.

Q Did you also, in connectionwith that evaluation or examination, examine the diagram that is Exhibit 5 in evidence, and I believe smaller versions of it are 5B.

THE COURT: 5A.

A Yes, I have.

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Q And did you also review the documents which comprise Exhibit 23, Plaintiff's Exhibit 23?

(Handing.)

A In a general way, yes.

Q And did you also review Plaintiff's Exhibit 74, which is a letter from Mr. Perrino to Mr. Romel dated February 18, 1965, and it deals with the subject of fooling the unit?

(Handing.)

A Yes, I have.

Q And I omitted to ask you if you have examined Plaintiff's Exhibit 2, 2-A, 3 and 4, which are physical components of the anti-skid system?

THE COURT: Perma anti-skid system.

MR. GRAND: Thank you.

A I examined these, not functionally, but this way, yes. I've studied them.

Q When you say you have examined them but not functionally, do you mean you haven't seen them in operation?

A I haven't seen them in operation.

Q Well, these, of course, are cutaways, but I assume that you are saying something broader than that, and that is that you haven't examined or observed any Perma

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anti-skid device functioning in operation.

A That is correct, yes.

O Have you also examined Plaintiff's Exhibit 94?

I think it is only for identification at this point, but I'm not certain.

MR. BENBOW: I gave you mine. I don't know. We believe it is only for identification.

MR. GRAND: Thank you.

THE COURT: It is a letter from Mr. Broeker to Mr. Person dated September 1, 1965, and it has attached to it three pages entitled, "Fail-safe Design, Deficiencies of Perma Anti-Skid Device."

Did you examine that document also?

A Yes, I have.

MR. GRAND: It just magically appeared. Here is your copy back.

(Handing.)

MR. BENBOW: Okay.

O Did you examine Plaintiff's Exhibit 98-C, which is a schematic showing modifications of a fail-safe and higher brake pressures?

MR. BENBOW: I didn't get your question.

MR. GRAND: I asked him if he examined that.

THE COURT: 98-C.

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A Yes, I have.

MR. GRAND: I would like to mark as plaintiff's next exhibit a document which has the caption of the case on it and it is entitled, "Plaintiff's Pretrial Memorandum."

This is only excerpts. On page 8 there are four reasons listed as to why the Perma unit was unacceptable to the defendant, and attached to that is a document entitled, "Additional Reasons Rendering The Perma Anti-Skid Device Unmarketable," which is also a document prepared and submitted by defendant. I am sorry. Not also; which is.

(Plaintiff's Exhibit 122 marked for identification.)

Q Did you also examine the contents of Exhibit 122 for identification?

(Handing.)

A Yes, I did.

Q At the moment I'm only intending to focus your attention on these relatively few documents. Am I correct that in the course of your evaluation of the Perma anti-skid device you have reviewed many more documents in our files?

A Yes, I have.

Q Now, in connection with your evaluation of the

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Perma anti-skid device, did you cause a computer modeling or simulation of the device?

A Yes, I have.

Q Can you tell me what you did in that respect?

A Yes. I retained an associate, Mr. Andre Devillier, who will be testifying, I believe, when I'm finished --

Q That is correct.

He is, your Honor, the next witness whom we have designated. We have advised defense counsel of that.

THE COURT: All right.

A Mr. Devillier modeled a typical vehicle for me while at Kelsey-Hayes. He was employed there at the time. I asked him to take the vehicle model, which was the same for all practical purposes as the one that Kelsey-Hayes used to model their system on, and model the Perma unit on that vehicle model that we had.

Q What was the source, if you know, of the information or the dimensions or the numbers relating to the Perma system that Mr. Devillier used in modeling his computer sample?

A Mr. Devillier received the information from Mr. DeRensis through documentations and otherwise.

Q Are you familiar with the source of each and every number that Mr. Devillier used in connection with his

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computer study?

A No, I'm not.

O That information we will have to get when Mr. Devillier is here as a witness?

A Yes.

O Now, can you tell us what specifically you assigned Mr. Devillier to do once he had modeled both a typical vehicle and the Perma system on a computer?

A I asked Mr. Devillier to simulate a battery of stops through various speeds and various road coefficients, with locked wheels and with the Perma model on the vehicle.

O Can you tell us what the range of roads surfaces was in terms of coefficientof friction?

MR. LAGEMANN: Excuse me. I would like to object. Once more we have hearsay. The witness has already said that somebody else gave the data.

MR. GRAND: No, no. This is instructions.

THE COURT: No. This is what Mr. Devillier was to do. I'll permit it.

At least I believe it is. Is that correct?

MR. GRAND: That is correct.

THE WITNESS: Yes, your Honor, it is.

The range of surfaces, road coefficients, that I requested Mr. Devillier to simulate his runs on was from

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.15 mu to .75.

Q Now, can you tell me what .15 mu is the equivalent of?

A It will be the equivalent of icy road or wetted down, painted surface, such as the one used by the auto industry to test vehicles on low coefficient roads.

MR. BENBOW: Can we have some time on this, your Honor, when this was done?

THE COURT: Sure.

When was it done?

THE WITNESS: It is --

MR. GRAND: When was what done?

THE COURT: When was the computer study done? We don't want an exact date. Within the past year.

THE WITNESS: Within the past few months.

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Q Can you tell us what .75 as a coefficient of friction is the equivalent of, what surface?

A Dry concrete road.

Q Can you tell us the basis for choosing that range of coefficient?

A Well, there are various sources. Primarily my experience at Kelsey-Hayes, and the Department of Transportation have a requirement for trucks for next -- for this year, rather, 1974, that goes in effect in September, they have a range of surfaces not nearly as broad as we chose, and also I reviewed a document describing the Bendix Chrysler unit and the range of surfaces of test that they reported was not as severe as what I chose.

So I felt this was even beyond what other people had gotten involved in. So it was done on experience in that too.

Q What was the range of surfaces and what is the range of surfaces that the Department of transportation is legislating with respect to?

A I believe it is .3 to .75.

Q Has Mr. DeVillier reported to you the result of his computer analysis and the test runs that he has made?

THE COURT: Yes or no.

A Yes, he did.

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MR. GRAND: Will you mark this the next exhibit.

(Plaintiff's Exhibit 123 marked for identification.)

MR. BENDOW: Your Honor, I don't think it should be handed up to you as yet.

MR. GRAND: I am sorry.

THE COURT: All right.

Q Let me show you Plaintiff's Exhibit 123 for identification and ask you what that document is.

Let me withdraw that and ask you if this document contains a summary of the results of what Mr. DeVillier reported to you?

A Inasmuch as stopping distances are concerned, this is what he did report to me, yes.

Q He also reported to you on subjects other than stopping distances?

A Yes, he did.

Q Did he report to you on the subjects of steering control and stability?

A Yes, he did. He reported to me that --

Q The answer is just yes at this point.

A Yes.

MR. GRAND: I anticipate, your Honor, objections both to my asking Mr. Goor what it was that Mr. DeVillier

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reported to him concerning stability, steering control and to the introduction of these figures.

I am not at this point particularly concerned about the information coming in for the truth of it, because as I have already stated to the Court and represent again, Mr. DeVillier is to be the next witness.

I suggest that this material come in subject to connection or, at the minimum, that it be allowed in because this is the information on which Mr. Goor relied in assessing the anti-skid device and arriving at an opinion. It will be, I represent to the Court, firmed up or, at minimum, subject to admission or nonadmission through Mr. DeVillier.

THE COURT: Do you have anything else in this area coming right now?

MR. GRAND: I am offering this exhibit and I am going to elicit some testimony.

MR. LAGEMANN: Your Honor, Mr. Grand anticipated correctly. We have to object to this as the rankest of hearsay I have ever seen attempted subject to connection. It doesn't seem appropriate.

THE COURT: This is a nonjury case. We will take it subject to connection.

(Plaintiff's Exhibit 123 received in evidence.)

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MR. BENBOW: Your Honor, I have a different kind of objection which I think incorporates Plaintiff's Exhibit 123, and that is the following:

I understood Mr. Grand merely to be pursuing the course of trying to qualify Mr. Goor as an expert with respect to the Perma device, a fact which in my mind still remains to be established, and not having established it it seems to me inappropriate really for that reason to receive Plaintiff's Exhibit 123, because it seems to me as of this moment Mr. Goor's opinion with or without it isn't worth anything in terms of the Perma device.

He has testified that he never saw the device in operation. I could look at this page of numbers as he can, but that doesn't make either him or me an expert in that device.

THE COURT: No, but it is my understanding that one of the bases of his opinion would be the computer module made by Mr. DeVillier.

MR. GRAND: That is correct.

THE COURT: As such, we are taking it all subject to connection.

You have to recognize that this is a very dangerous way of proceeding, and I assume, Mr. Grand, that you do recognize it, to have an expert and put it in

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subject to connection and he testifies to his opinion on the basis of something that is subject to connection. If you don't make the connection the whole opinion gets thrown out.

MR. GRAND: I understand that.

MR. LAGEMANN: Your Honor, if I may interpose, the figures on this, what connection are they subject to?

THE COURT: Just as numbers that were given to him, that is all. When Mr. DeVillier comes we will find out where they came from, in the sense of what mathematical formulas, what type of programming was used, and so on and so forth.

MR. GRAND: That is correct.

Q What did Mr. DeVillier report to you concerning steering control?

A Report to me that under all the surface conditions tested --

MR. LAGEMANN: Your Honor, I must object again. It is hearsay.

THE COURT: That is all right. I will permit it again subject to connection.

A That under all the surface condition that the unit was tested, were all the complete range that it was tested under, we essentially had good steering control.

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On the low mu the front wheels were turning much of the time over half, usually quite evenly distributed through the stop, allowing for good steerability. On a higher mu they rotated most of the way, allowing for very good steerability.

THE COURT: Wait a second. You said, unless I heard you wrong, the front wheels rotated, is that correct?

THE WITNESS: Yes.

MR. GRAND: He is only talking about steering, your Honor.

THE WITNESS: This is only steering control, your Honor.

THE COURT: I understand.

Q Am I correct, Mr. Goor, that steerability is determined by front wheel rotation?

A Yes, it does.

Q What did Mr. DeVillier report to you concerning stability of the vehicle?

MR. LAGEMANN: Once again, the same objection.

THE COURT: Same ruling. Go ahead.

A He reported to me that on all these surfaces the unit functioned properly as a skid control unit with the rear wheel rotating a sufficient amount to allow for good directional stability.

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A Yes, that is true.

O Where the difference is 1/10 of a foot?

A Yes, it is.

O And at .75 at 25 miles an hour the stopping distance was extended by 4/10 of a foot with the device rather than without it?

A Yes, it does.

O But at 60 miles an hour it was reduced with the device?

A Yes, thatis correct.

O You have testified that you did not engage in actual road or performanc testing of the Perma anti-skid device.

Can you tell me the reasons for that?

A Yes. When I was initially retained to evaluate the system it seemed desirable to try and make some vehicle test, but the people who retained me, Mr. Perrino, did not authorize me the large expenditure that it would have required to be able to assemble the proper kind of vehicle and equipment, quite a large expenditure, I might add, to do the job.

O Were there other reasons as well?

A Yes. Inasmuch as the device was designed to fit without modification 1964 vehicles, to make a meaningful

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test without, again, modifying and expending a great deal of money, one would have had to find both a set of hardware that would be representative, which I was told was nearly impossible to do --

Q By hardware, you mean Perma anti-skid hardware?

A Perma anti-skid complete system as it was at the time. And secondly, a vehicle in a condition that would be satisfactory enough to run the kind of strenuous testing that would be required at that time.

Q In addition to the computer simulation, have you examined the white report, Plaintiff's Exhibit 19, the Cadillac report, Plaintiff's Exhibit 21, and the Ford report, Defendant's Exhibit 12, all of which relate to tests in either 1963 or 1964?

A Yes, I have.

MR. BENBOW: Might I inquire whether Mr. Goor examined the various versions of Plaintiff's Exhibit 21?

MR.GRAND: I don't think you have established that.

THE COURT: I don't know.

MR. GRAND: He is referring to a document he offered and has not come into evidence.

MR. BENBOW: You have been showing Mr. Goor other documents which have not come into evidence too,

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THE COURT: It is his opinion.

MR. GRAND: That is correct.

MR. LAGEMANN: The point is, your Honor, he is not qualified as an expert in testing of anti-skid devices in any wise.

THE COURT: I will still let him answer.

Go ahead, give us your opinion.

A We-l, inasmuch as I ran a lot of skid stops myself, I feel that a narrow stip of 18 inches on each side for the wheel would make locked wheel stops at best very, very questionable.

O Coming back, if I may, to Plaintiff's Exhibit 123, just so that the record will be clear even before Mr. DeVillier comes, you have testified that the vehicle that he simulated was a typical vehicle. Was the typical vehicle based on any particular model car?

A It was based essentially on a 1967 and '68 vintage Thunderbird.

O This exhibit refers to pressure switch settings. Specifically, I am referring to opens at 115, closes at 159.

Can you tell me the basis, if you know, for using those particular pressure switch settings on a computer simulation?

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A I personally don't know, but Mr. DeVillier showed me --

MR. LAGEMANN: Objection.

THE COURT: No, I will allow it.

A Mr. DeVillier assured me, in the same manner that he had done a simulation at Kelsey-Hayes, that this was done in order to accommodate the difference in the vehicle, and that it was valid.

Q The difference in what vehicle?

A In -- to do the same thing on a 1968 vehicle. He will have to testify to the specifics of that.

Q I am just trying to clarify what you are saying. To accommodate the differences between say, for example, a '64 and a '68 vehicle?

A Yes.

Q Can you tell us what the statement there that says, "Gear ratio 24 to 1," represents?

A Well, this was really only done to achieve a rate of speed, an equivalent rate of vehicle speed when the governor opens and closes. The number 24 to 1 was only used to accommodate a simplification on a computer run. Other things, such as weights or springs, can achieve the same difference.

Q I think that may just be a little too criptic.

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What was it intended to achieve or to simulate on the computer?

A It was intended to achieve a rate of activation of the governor in a unit.

BY MR. GRAND:

Q The question is, do you have an opinion?

A Yes, I do.

Q And can you tell me, what is that opinion?

MR. BENBOW: Do I need to renew the objection to that?

THE COURT: No, no. We'll have a continuing objection noted.

A The question is could it have been made?

Q Yes.

A I believe it could have been made, yes.

Q In terms of which criteria are you stating your opinion?

A I think from a performance standpoint, such as stopping distances and yaw control --

THE COURT: Yaw?

A (Continuing) Yaw control; directional control -- I feel that the unit could have been, if it wasn't at the time, which it could have been, made marketable. As far as the criteria that we established for failsafing, I found no place at that time where the unit had such a device, but it could have very easily been incorporated either in a manner that --

Q We'll get to that.

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A It just detects the movement, and then, after a period, a set period, through heat it either brakes or makes a contact that then disengages the system.

I might add that I think it would cure a lot of ills if in addition to disconnecting the system that unit could have been put in the back of the unit and open it to atmosphere in case the thing didn't function properly.

Q You are talking now about a fail-safety device.

A Yes. That would be a very simple thing to accomplish.

Q Are there other such devices other than the two that you've mentioned?

A I'm sure there are numerous, but I'm not specifically familiar with what -- many devices that I'm not specifically familiar with.

MR. GRAND: Your Honor, --

THE COURT: We have arrived at that magic moment.

MR. GRAND: We have arrived at that magic moment. I have a question. It is written out to myself. If you would like me to, as we indicated in chambers, type that, give it to Mr. Benbow, I'll do that --

THE COURT: And give it to me also.

MR. GRAND: I'll do that Monday. So that it will be in both of your hands by Monday noon.

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Q To complete the record at this point, Mr. Coor, let me ask you whether there were other computer runs of the Perma anti-skid device other than those represented by Plaintiff's Exhibit 123 with the pressure switch and the threshhold settings as stated on 123.

A Yes, there were.

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Q And--

THE COURT: Mr. Coor, please, once again, let me remind you to keep your voice up.

THE WITNESS: Thank you.

Q And you will recall that the gear ratio provided in Plaintiff's Exhibit 123 was 24 to 1. Does Plaintiff's Exhibit 124 for identification depict results with a gear ratio of 12 to 1?

A Yes, it does.

Q And does Plaintiff's Exhibit 125 depict results with a gear ratio of 18 to 1?

A Yes, it does.

Q And do these documents represent the results reported to you by Mr. Devillier's of runs he made?

A To the best of my knowledge, yes.

MR. BENBOW: I object to that, your Honor. Does he even know the answer to that question?

THE COURT: I will permit it.

MR. BENBOW: There is a continuing hearsay objection, I assume, your Honor, to this whole line.

THE COURT: Absolutely, yes.

MR. GRAND: At this point, your Honor, I'll offer these additional documents, Plaintiff's Exhibits 124 and 125.

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THE COURT: Mr. Benbow, do you have any objection which you stated in connection with Plaintiff's Exhibit 123 plus your continuing hearsay objection?

MR. BENBOW: Well, I have the further objection, your Honor, that the witness can't even state that he knows he received these.

MR. GRIND: I think that is--

THE COURT: No. Hold it.

MR. BENBOW: What does to the best of my knowledge mean?

Is that yes or some other formulation?

THE COURT: Well, we have different formulations at different times. I'll permit it.

It is, of course, being received subject to connection and we expect that Mr. Devillier will testify in connection with these exhibits.

MR. BENSON: Your Honor, I would like to state for the record that we have, in view of the recentness with which this was done and apparently typed up, we have asked Mr. Grand to provide us, as I understand he has agreed to do, during the period that the Court is in recess in this case, the back-up information that went into these computer studies and I just thought it ought to be on the record that we have made that request and Mr. Grand has agreed to provide it to us.

THE COURT: Sure.

MR. GRAND: I didn't know I had. I thought--let me consider it.

I thought what I agreed with Mr. Lageman was that the back-up material is obviously relevant and it was our intention to introduce the back-up material through Devillier and I think that--let me consider whether--

THE COURT: Let me suggest to you, if you are going to introduce it through Mr. Devillier, I assume it will come out in the form of a computer run, is that correct?

MR. GRAND: Correct; probably.

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THE COURT: Now, Mr. Logeman and the expert for Singer may be in a position to run through a computer run in no time at all and figure it out but I don't believe it.

MR. GRAND: We will be happy to produce the computer runs during the--

THE COURT: During the break period. You will have enough time.

Q Mr. Coor, I want you to assume that on December 21, 1964, you were employed by a company which had entered a contract pursuant to which it was required to use its best efforts to manufacture and market the Perma anti-skid device, including its best efforts in collaboration with Perma to perfect the device so as to make it marketable.

Also please assume you were placed in charge of a program to accomplish this end.

I want you further to assume that your employer had knowledge of the following prior to December 21, 1964:

A. Ten months earlier, in February of 1964, your employer was told the following among other things, by Perma:

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1. The Perma anti-skid device "will stop you faster with less tire wear as well as providing positive control action during stops on any road surface."

2. The device has proven "its longevity and dependability well beyond the useage of any motor vehicle" and is "a perfected patented device proved and accepted by safety officials as well as autmotive engineers and mechanic

And the device has a failsafe feature which "will automatically revert to the standard braking system in case of failure."

MR. BENBOW: Before we leave page 1, your Honor, should not the introductory words to A 1, 2, and 3 not be knowledge but belief? I am referring to the phrase that reads I want you further to assume that your employer had knowledge, had the belief.

THE COURT: No. I will permit it.

Q B. Perma, in February of 1964, was operating under a manufacturing contract with another company and in February or March 1964 delivered a set of specifications, blueprints and a bill of materials to your employer.

C. Your employer entered into a contract with Perma in June 1964 pursuant to which your employer was to manufacture the device and that between June and December 1964 the parties experienced the following problems with the

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device, among others:

1. The cam gear hanging up. Part of its fail-safe feature.

2. The rotary valve binding.

3. The pressure switch malfunctioning and leaking.

4. At least one report of loss of brakes.

D. Between June and December, 1964, a number of change orders authorized by Perma, authorized changes in specifications for parts of the device broadened manufacturing tolerances and in some instances resulted in redesign of components.

E. Finally, before entering into the second contract on December 21, 1964, your employer was advised that the Perma device had been tested by a number of original equipment manufacturers and others, that some of those tests disclosed shorter stopping distances when the device was used as compared with cars not using the device, that others disclosed longer stopping distances under these circumstances, and that others revealed mixed results.

Now, I want you to state your expert opinion as to the appropriate steps which your employer should have taken after December 21, 1964, to manufacture and market the Perma anti-skid device, including its best efforts in

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collaboration with Perma to perfect it so as to make it marketable.

THE COURT: Mr. Goor, hold on for a minute.

All right, Mr. Goor.

Q Why don't you go ahead, Mr. Goor? Do you have the question in mind?

A Well, in view of the vast amount of information and in a number of apparent contradictions in the information shown, I would--

MR. BENBOW: I haven't heard the answer thus far.

THE COURT: All right. Mr. Goor, you are going to have to keep your voice up.

Mr. Reporter, would you read the start of the answer.

(Record read.)

A I would initially take a few days to review with whatever staff was available both the information, whatever hardware may have been available, the drawings, test results, and whatever else was available.

Should the review confirm the information on this sheet--

Q By this sheet, you mean the information contained in the hypothetical question?

A Yes, sir, that is what I meant--I would at that

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point suspend any manufacturing operation--

Q Perhaps you can tell us what specific information which if confirmed, would lead you to suspend manufacturing?

A Well, two major--

MR. BENDOW: I object to the interruptions of the response to the question for this purpose. I mean, is the witness now supposed to be giving expert testimony and be guided in the giving of that testimony by Mr. Grand?

THE COURT: No. I will permit it. Go ahead.

A Two major points that would indicate the need to suspend manufacturing. The one is under A, item number 1 makes a statement that the device has failsafe features which will automatically revert to the standard braking system in case of failure--if the result of the examination of the unit in the definition of failsafe of the type that we--that I described last week, this unit does not appear to have such features at this stage.

MR. BENDOW: Your Honor, I object to the witness' recent response. It seems to me it goes beyond the ambit of the hypothetical question that he is supposed to be responding to and now he is offering his other facts based on other assumptions.

I thought the wholepurpose of this long question

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exercise is to get the answers to this question.

THE COURT: No. I will permit it. Go ahead.

A The next and very major point is in item C, number 4. If I could confirm that it was a loss of brake in at least one case that was directly attributed or as a result of the system, that would be for me sufficient information to halt work on the system and investigate the reasons and try to correct it inasmuch as necessary.

(Recess.)

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(Plaintiff's Exhibit 126 marked for identification.)

MR. GRAND: May I proceed, your Honor?

THE COURT: Yes.

MR. GRAND: Your Honor, may I inquire who the additional gentleman is?

THE COURT: I don't know. Mr. Benbow, is this gentleman with you?

MR. BENBOW: I believe he is. The gentleman is Mr. John Hare, who is one of Singer's computer simulation experts.

I am sorry. I said John. There are too many John's. George Hare, of course. Excuse me.

MR. GRAND: Is it proposed that Mr. Hare is to be a witness?

MR. BENBOW: No.

BY MR. GRAND:

Q I believe you have now testified that the first thing you would have done, the first step, in your opinion, which would have been appropriate, would be to stop manufacturing?

A To suspend it, yes.

Q Can you identify Plaintiff's Exhibit 126 for identification?

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A Yes, I can.

Q What is that?

A It is an approximation of a program I prepared for you suggesting how such an undertaking may take place.

Q You say how such an undertaking may take place. By that are you referring to--

A Preparing a system such as the Perma unit in the condition that it appeared to have been at the date of the hypothetical question, preparing it for production and marketing.

Q Can you tell us what the first step would be after the suspension of manufacturing?

MR. BENDOW: Your Honor, I object to this line of testimony as related to the hypothetical question.

If Mr. Goor wishes to testify about this exhibit independent of that question there may be a ground of relative examination. But it seems to me that the exhibit goes far beyond and is so unrelated to anything contained in the hypothetical question that I will object to its being linked in that fashion.

THE COURT: The exhibit is not being offered now. I think it is being used to possibly refresh Mr. Goor's recollection. In the sense that this is the type of program which one would have to sit down and work out on a

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step-by-step basis, it is kind of hard to keep all the steps in one's head.

MR. GRAND: That's correct, your Honor.

THE COURT: I think that is what they are driving at. It is not being offered now. If it is offered I will consider the objection at that point.

MR. BENBOW: But your Honor, in his last answer, testifying supposedly about this exhibit or this exhibit for identification, he referred specifically to the hypothetical question and related the two together.

THE COURT: I understand that. However, I still think, since it is not being offered yet, and it is being used I believe, in that way--is that correct, Mr. Grand?

MR. GRAND: That's correct, your Honor, at this point.

THE COURT: All right. I will permit it.

After we suspend manufacturing, what is your next step?

THE WITNESS: Well, another problem in the question that was glaring is the statement E, regarding varying stopping distances that seemed to be somewhat contradictory from one test to another, not in any way stating that any other tests are any more reliable than other tests.

This would bring to mind a question of ensuring that the concept as implemented in its broad scope could

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even feasibly do what the system was intended to do.

Q And to accomplish that, what step would be appropriate?

A Well, before one attempts to do that the proper step is to be assembled, obviously. I am not too sure what I may have found in your hypothetical question at my employer's in line of staff.

Q I think what you are saying is that the hypothetical doesn't tell you what the staff was at your employers?

A Right. It might have been satisfactory, might have not. But at minimum, I would feel that in order to undertake the charge that was given me in the hypothetical question the proper staff has to be assembled, which would include a project engineer.

It should be a graduate mechanical engineer, hopefully with an advanced degree, and a man with a great deal of experience, I would say, of probably no less than ten years, who could be in a general term the technical head of the development.

It would require a system man. It says here system analysis, but it just--a system engineer.

Again, what I would--

MR. BENBOW: Can we have it clear that when he says "it says here a system analysis" he is referring to

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the document which he himself prepared?

THE COURT: That's correct, yes.

A The term is reasonably vague. Analysis and system engineer could be the same thing. The reason I qualified it, many people now days consider analysis only computer people. A system man is someone who can analyze a system, not necessarily just be limited to a computer type background.

Now, the man for that position should again be a mechanical engineer with very solid mathematical background, hopefully a degree in each, a man with control system knowledge, inasmuch as this system is basically a control system, and someone, if possible, with some automotive experience, if not, with--well, hopefully with some automotive experience, which could be helpful, even though it is not imperative.

At this point in order to accommodate the project two qualified technicians who can do programming, should also be added to the staff. They would be back up in all the areas of evaluation of the system. I would propose another mechanical engineer, again a man that had background in automotive areas with a few years experience, who could do such things as failure analysis and in general evaluate system quality.

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Q Tell us for what specific step or stage you are now staffing?

A Well, to begin the program I would staff with these--

Q What does the beginning step of the program consist of?

A Well, it is a system evaluation, concept evaluation, and as soon as possible--and that depends again on the hypothetical question, how soon products can be available. The statement seems to indicate that units were made prior to this date in various stages. If the type of units--

Q Before we get to that, we are still staffing, I gather, for your system evaluation.

A Yes.

Q Have you given us all of the staff for the system evaluation?

A Yes, I have.

Q Can you tell me what the system evaluation or feasibility study in your opinion, should consist of?

A Well, it would be a number of things. Initially it would be a vehicle model that would be representative of a vehicle of that era and a model of the Perma device in as much as one can construct one from the varied available information, but primarily the concept, even if some of the variations may be slightly different.

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Q You say your modeling is for a computer?

A Yes. At that point the system model would be evaluated as to its performance on the system under varying conditions to see if it--if the concept as such, disregarding some of the various parameters--

Q What kinds of conditions are you talking about modeling?

A Various coefficients of roads, various speeds, similar to our exhibits of last week and this week, to indicate if that unit could consistently or could appear to be able to consistently meet the guidelines that we felt were necessary to design--to build the system to.

Q At the point when you have modeled the system and modeled a car and developed or simulated computer runs of the system on the car, what then is the appropriate step to take in your opinion?

A Well--

MR. BENBOW: Your Honor, I want to renew my objection. It seems to me we are so far from the hypothetical question here as to be absurd.

This is directly contrary to the facts as stated in the hypothetical question, that this was a device that had not only been presented but previously manufactured, manufactured by the new so-called employer, had gone through

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all this procedure, had been on the market, had been manufactured, and now we are talking about something that is wholly hypothetical and speculative and unrelated to the hypothetical whatsoever.

THE COURT: No, I think it is related. The question was as to the appropriate steps and he is giving the steps that he considers to be appropriate. I will permit it. Go ahead.

A Well, I can actually give the step with background because this is the kind of thing that I have been involved in in the past, of assuming over something that was either in or supposed to be in production with varying data. I have done that for two very large companies and I found it to be quite necessary when you represent someone else and you put the name of that company on your unit that for your own knowledge, you completely evaluate the system, specially when the previous data is somewhat contrdictory and not very clear.

As far as the feasilibyt study, we have now some benefit of hindsight from the computer runs we made, which would have been similar to the ones we would have done in this program, showing that the system could have been made to meet the specifications that we intended for it to meet, and you would at that point staff and attempt or begin to

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start running some prototype test on vehicles inasmuch as that the computer will not simulate everything that one finds in a vehicle.

Q Does the feasibility study break down into phases?

For example, after an initial evaluation of the system on--

MR. BENSON: I object to the leading character of the question.

THE COURT: I will permit it.

Q --on the computer, are there modifications that take place within the system on the computer?

A Well, a computer study that I intend or I would have intended to do would include what I call upgrading. These would be making changes in the control peramater of the system, changes that will not immediately reflect hardware but that can be in some manner easily incorporated in hardware, to see how this may effect the system performance.

These changes will be then fed back to those people who are in charge of prototype evaluation to be incorporated in the system in some manner that is feasible for manufacturing and evaluate that performance on the prototype vehicle. Now--

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Q Before you get to the prototyping, can you tell us what in your judgment is the necessary or appropriate duration of the computerized study and what is the cost of it?

A Well, it would have an initial feasibility period to determine the feasibility and possibly do some upgrading that would take probably around three months.

It will continue into upgrading and then, of course it will be continual through the rest of the program to try to incorporate into whatever improvements may be required as the program continues.

The initial phase, which will take six months, stuff to be fed back into prototypes and cross talk between prototype and computer in order to try and maximize performance of the unit, would cost approximately $100,000.

Q And would take--

MR. BENBOW: Your Honor, I object to the answer and move that it be stricken. It assumes that the outcome of the feasibility study would be favorable and we have no indication that in this instance the conduct of such a feasibility study would have been favorable.

THE COURT: I will permit it.

Q And the duration of that period?

A The duration of the period on a high level would

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be six months, although it would be a continuous program through the duration of however long one stays in the business.

Q After the feasibility study, what is the next appropriate step in your opinion?

A Well, it would be to include some more staff and equip some vehicles with prototype units as representative as production with feedback from the initial feasibility study.

Q Can you tell us first what would be the appropriate additional staff?

MR. BENDON: I renew my objection, your Honor. We haven't even heard what the action would be if the feasibility study turned out negative and we are going on to the assumption after additional staff.

Is it notpossible that the whole program would terminate at that point?

THE COURT: It seems to me that is rather obvious. The whole program would terminate if the feasibility study showed that it wasn't feasible.

THE WITNESS: That's correct.

THE COURT: Now, Mr. Grand suggested that you would need extra staff. Who would you include?

A Well, I would include two drivers and two

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mechanics. At this stage, probably one draftsman and one prototype machinists.

Q What should this stage consist of in your opinion?

A Well, it would consist, in addition to prototype tests--

Q Before your testing prototypes, I assume you have to have them available. So you have to build them, I gather.

A Again, in the hypothetical question I gather--and this would effect the time period of the program--that units were manufactured. They will have to be evaluated to see if they are either manufactured properly or could represent in at least general terms what one looks for in this design or else one would have to manufacture prototypes that would reflect whatever upgrading might have been done on the computer to that date and install on instrumented vehicles that can generate tapes on which will be recorded various functions of both the system and the vehicle.

Q You say vehicles which can generate tapes.

What do you mean by that?

A Well, instruments that can generate tapes, oscillographs, not the vehicle that can generate tapes.

Q In other words, you would put prototypes on vehicles that had been equipped with test equipment?

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A Yes, I would.

Q And record the results of those tests?

A Yes, I would.

Q Would there be any or should there be any upgrading as a result of the prototype testing?

A Well, this phase of the program should incorporate a number of things. It should--the prototype phase of it should take in feedback from the computer as to whatever control changes may have been recommended to improve the function of the system. The results of such changes will be then fed back to the analytical people, who can then evaluate and see how it complies or conforms to what their simulation might have shown.

They may have to make a few corrections inasmuch as some things may not be indicated initially that they may find on the vehicle.

It will be a communication and continuous cross talk to try and upgrade the system so that it would do its best function with the constraints that one may have at that given time.

Q What do you mean by the constraints that one may have?

A Well, within the basic design concepts and so on and so forth.

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Q I see.

A At the same time one would get involved or undertake an extensive failure analysis program, which I think is an extremely critical thing prior to even considering introducing a system on the market place, specially a system that would deal with braking.

MR. BENSON: Objection, your Honor.

THE COURT: No, I will allow it. Go ahead.

A The failure analysis primarily would involve a number of things and can call upon computer analysis too to keep it current. It would involve the review of each system component and what failure could be created in the system by whatever failure may happen to that given component.

There are two things that will be done. One, you would assign a weight to each type of failure so that you will have an indication if the failure was unacceptable that it required redesign and if it was only a minute one you may decide to just fix what you have in a minor fashion, and you will also attempt to introduce at this same stage an initial probability of failure evaluation to it--of the various components, and again assign a weighting factor to that and a combination will help you decide what components need to be completely redesigned or if they are

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satisfactory and what failure can be anticipated.

MR. DENBOW: Your Honor, objection again. It seems to me that this is so far beyond the realm of the hypothetical question, which even as stated I objected to--it only talked about a perfected and existing device that had already been marketed.

Now he is talking about completely redesigning and creating this, that and the other thing. This testimony I object to as neither relevant nor competent.

MR. GRAND: I assume that the characterizations by Mr. Denbow--

THE COURT: No, no. I will permit it.

After you have done your failure and [illegible]sis--most of this is being done on computer program, is that correct?

THE WITNESS: Well, it can be continuous computer programming and whatever feedback from tests that come back will be fed into the system and incorporated into the decision making process.

THE COURT: We then get to our next step, right?

THE WITNESS: Yes.

MR. GRAND: Before we get to that, if I may, your Honor.

THE COURT: Sure.

Q Can you tell me the duration of this step,

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namely, the prototype build up and failure analysis?

MR. BENBOW: Objection, your Honor, as speculative.

THE COURT: No.

Q What in your view is the duration or should be the duration of such a stage?

A Oh, I would say probably around five months.

Q Can you estimate the cost?

MR. BENBOW: Objection, your Honor. There is no basis--

THE COURT: No, no. I will permit it.

MR. BENBOW: May the record note that the witness is referring to the exhibit that he prepared, 126, in responding to the answer.

THE COURT: He has been looking back and forth at it throughout his answer. That is all right. Go ahead.

A Well, inasmuch as these are programs that go at the same time, the additional cost as a result of this function, I figure would be around $60,000.

Q And what should be the next stage or the next step?

A Well, the next step would incorporate a number of things, some that directly ties up to the criteria that one must meet in order to develop a system, and that will

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be an environmental and reliability test, which would require that units are tested under the various environmental conditions anticipated in a vehicle.

Q Before you get to that, can you tell me under this program what units should be tested for reliability and environmental endurance?

A Well, at that point, in view of the upgrading that was done on prototypes and computer study, where units are functioning in a way that can now be considered satisfactory, one would manufacture what I would call pre-production units, which by my terms would mean to take the design as was tested on a prototype and reflected on a computer and in a prototype shop produce it in such a way that it could be easily converted to mass produced--to mass production.

Q In order to do that, what kind of staff would you need to add at this stage?

A Well, an initial--very first important addition would be another mechanical engineer with automotive manufacturing background.

MR. BENBOW: Objection, your Honor.

THE COURT: No, no. I will permit it.

A And with background in the areas of taking engineered product in the automotive industry and converting

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them into production items in the automotive industry.

Again, it would have to be an experienced individual with a number of years experience.

In addition to this man I would add one technician and four drafting people.

MR. BENBOW: Not three or five, I take it?

MR. GRAND: I object to Mr. Benbow's cute comments.

THE COURT: All right.

MR. BENBOW: We are in such a never, never land, your Honor.

THE COURT: All right, Mr. Benbow.

Q With this staff what steps should be taken, with this additional staff?

A Well, a battery of reliability--a program of reliability and environmental tests will be undertaken.

Q Can you tell me initially approximately how many of these pre-production samples should be built?

A Well, I would make an estimate of approximately 24 units. Some of these will be put on vehicles that had the prototype units on before and replace them, the rest of them will be put in environmental chambers that will be cycled continually and monitored to evaluate the probability of failures and the ability of the unit to function properly

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through the range of environmental conditions that it may be exposed to in the vehicle.

Q Where else, if anywhere, in addition to environmental chambers, would you put the rest of these units?

A Well, I mentioned that some of them will be put on the prototype vehicles in place of the prototype units so that they can be evaluated in actual running condition of the vehicles and again any feedback regarding performance that might have been degraded by converting the prototype means of production to pre-production be corrected in some manner so that the performance is still satisfactory.

Q How could--

THE COURT: When you say degraded do you mean downgraded?

THE WITNESS: Downgraded, yes, sir.

Q How could such downgrading occur?

A Well, you may, in order to accommodate mass production processes, you may do such thing as decide to decrease angles that are easily machined in a prototype shop but may not easily lend themselves to mass production. You may decide to take a component that would be easily produced in a shop but would be expensive and you try to design it in a way so that it can be cast or be--that can be processed using a process of mass production.

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Q Does this stage also involve any test stand work other than environmental chambers?

A Well, the test stand work will be done both in environmental chambers and outside of environmental chambers.

Q Can you tell us the period involved in this stage of the development?

MR. BENBOW: Objection, your Honor.

THE COURT: Repeat the question, please, Mr. Reporter.

(Question read.)

Q Perhaps I should say in this stage of the program that you are outlining.

THE COURT: I will permit the question.

A I would have to estimate it to be somewhat in excess of five months.

Q Can you estimate the cost of, one, the testing, and two, the construction of the pre-production samples?

MR. BENBOW: Objection, your Honor.

THE COURT: I will permit it.

A As this project will go into a phase whereby some production samples will be made too, a lot of the reliability tests will be converted to check production samples. The reliability test phase, which again will not

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culminate at the end of the five plus month period but will be continuous to reflect any additions or changes in the system that may take place as it is being produced and developed, will cost, in my estimation, about $100,000.

Q What about the construction of the pre-production samples?

A Well, the pre-production samples, with a preliminary or possibly upgraded set of drawings, some place around $80,000.

Q Does this phase of the program involve any other stages?

A Well, yes. It would involve the beginning of converting the pre-production drawings to production drawings, the assurance that the various component parts of the system are such that they would comply with--inasmuch as possible, with industry standards, it would be the introduction phase to the production design that then eventually would be released to production.

Q And the cost of the production design work, what do you estimate that to be?

A I would say the cost of doing this, performing this function, would be around $60,000.

Q The next phase of the program that you have outlined would involve what steps?

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MR. BENBOW: Your Honor, if we could shorten this in way, I can read 126 as well as Mr. Goor can.

THE COURT: But I can't because it is not in evidence.

MR. BENBOW: All right, your Honor.

THE COURT: You want to put it in?

MR. GRAND: I am perfectly happy to offer it, your Honor.

THE COURT: Mr. Benbow, do you want to put it in?

MR. GRAND: I will offer it. It is a plaintiff's exhibit.

THE COURT: You offer it. Do you have an objection, Mr. Benbow?

MR. BENBOW: YEs, I do, your Honor.

THE COURT: All right. Then let's go the other way.

THE WITNESS: Well, at this point I would make or have made a couple hundred of sample units of the production design, equip both the prototype cars and some fleet vehicles, such as police, taxis, or other fleets who would be willing to allow us to equip the system with it and allow for feedback and review of whatever may happen while it is on the vehicle, and then put some 50 or 60 units in

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environmental chambers and continually run them to generate probability of failure information and their ability to function under the various vehicle conditions.

Q What staff, if any, would be added in the fleet buildup phase?

A Well, it would be a buyer, an expediter, someone who can get parts as required, and so on and so forth, and the other drafting people that we have not added prior to this.

Q How many additional draftsmen are you speaking of?

A It is approximately two. These numbers are close.

Q The approximately 200 units that are to be built for the fleet build up, where should such units be built?

A Well, these would be built probably in prototypes and some of them may be made by outside vendors, again, to production drawing specifications.

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Q Are they made in machine shops or what are essentially machine shops?

A Yes, to try and keep within manufacturing toleran anyhow.

MR. BENDON: I apologize. I did not hear the answer.

(Answer read.)

THE COURT: Mr. Goor, please keep your voice up.

Q Now, this phase of fleet buildup and testing should take approximately how long?

A Well, depends on when the prototype units could be made available but I would say around 14, 15 months or possibly slightly less if production--

Q I am speaking only of this particular phase of it, the fleet buildup and testing portion of it.

A Somewhere around five months.

Q And the cost of that phase of the program should be what?

A Additional cost, probably around $40,000.

Q And I gather from your testimony that these various periods you have alluded to are not added one to the other but are to some degree overlapping periods?

A They all definitely overlap.

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Q And at the conclusion of the fleet buildup, and test program, what is the next step?

A Well, any problem that may occur would obviously have to be incorporated into the design.

If no problem of any significance showed themselves up, a production release and a general freezing of design would take place at that point.

THE COURT: Production release?

THE WITNESS: Yes.

MR. GRAND: I think that we stated something about problems being incorporated in the device.

Could we read the last answer back? I think you may have misspoken.

(Record read.)

A I didn't mean a problem had to be incorporated but a correction to these problems.

Q From the beginning of the feasibility study to the release of production, what in your estimate is the overall length of time that would be required?

A Well, if prototypes were not available at the beginning, I would say the period would be around 14 months, 15 months, maybe slightly less or slightly longer.

MR. BENBOW: Your Honor, I object again if this question is supposed to be related to the hypothetical ques-

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tion. He says if the prototype is available. I mean, is he referring back to the hypothetical question or isn't he?

He seems to be testifying in a vacuum and yet this whole line of questioning is purported to relate to the Perma device and hypothetical question that was asked him and I claim it's got to be one or the other and the last question was certainly inconsistent with the existence of the hypothetical question or the existence of the Perma device.

THE COURT: Well, I disagree. I will let it go in.

Go ahead.

Q I think you have only testified that if there were no prototypes available it would be approximately 14 to 15 months to the point of releasing to production?

A Yes, I did.

Q And if there were such prototypes available?

A It could cut the duration back by as much as two, maybe a little longer; two months or a little longer.

Q Now, should there be, in the program that we have been describing, any continuous upgrading after the termination of each stage?

A Oh, yes. A program of this nature would require a continual operating so long as the people in it want to

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stay in the business.

Q I mean from the commencement of the program to the release to production?

A Yes, there will still be a continuing operating through that period and beyond.

Q Have you developed a separate cost figure for continuing upgrading from the beginning of the program to the release to production or to a later date?

A For this stage I developed a separate one that I showed as $180,000 meaning somewhat over $10,000 a month. It would more than likely be somewhat in excess beyond the release to production to stay in business.

MR. BENBOW: I object to that as being inconsistent with Plaintiff's Exhibit 126 in which--

THE COURT: Well, 126 is not in evidence so it doesn't much matter.

Go ahead.

Q Do you have an opinion as to the length of time which should have been necessary to make the Perma anti-skid device marketable and ready for release to production?

THE COURT: I thought that's what we were talking about.

MR. BENBOW: Objection, your Honor. It is an assumption.

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THE COURT: Go ahead.

A Again, on the same basic ground rules, I would say approximately 14 months.

Q Do you have any opinion as to the cost of making it marketable up to the stage of releasing for production?

MR. BENSON: That I certainly object to, your Honor. He has no basis, whatsoever, for making any such assumption.

THE COURT: I will permit it anyway.

A I would say approximately three quarters of a million dollars.

Q Does that figure include any estimate of the cost of tooling for production?

A No, it does not.

Q Does it include any estimate for the cost of manufacturing facilities?

A No, it does not.

Q Does it include any estimate for the cost of raw materials for production?

A No, it does not.

Q Does it include--that is, the three quarters of a million dollar figure--an estimate of the cost of any facilities whatever used in the course of the program up to the point of release to production?

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A Yes. It would include the cost of renting an engineering facility, the prototype and of leasing test tracts as and when they are needed.

MR. GRAND: Your Honor, I think for clarity's sake, at this point I will offer Exhibit 126 for identification.

THE COURT: Mr. Benbow, I assume you object to it.

MR. BENBOW: I certainly do, your Honor.

THE COURT: Objection sustained.

MR. BENBOW: Thank you.

THE COURT: However, I want to just before we break for lunch, I want to ask one question of you, Mr. Goor.

We have talked and in your answer you have discussed computer programming and computer models.

Are you basing this upon the type of hardware available in 1964, the end of 1964?

THE WITNESS: Yes, your Honor. I am basing it on the fact that a number of companies that I know of first-hand in developments similar to this one used computers at that stage; not just one company.

THE COURT: In 1964?

THE WITNESS: Yes.

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THE COURT: In other words, there was the hardware available at that point for such computer programming?

THE WITNESS: Yes, sir.

Q Would you tell us the names of some of those companies?

THE COURT: It is not necessary.

Let's break for lunch.

MR. GRAND: What time shall we return, your Honor?

THE COURT: Oh, yes. I have the pleas today.

Why don't you take an extra half hour. I am fearful that I'll be quite long in taking the pleas.

MR. GRAND: 2:30 then?

THE COURT: 2:30, yes.

(Luncheon recess.)

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AFTERNOON SESSION

2:30 p.m.

xr DANIEL GOOR, resumed.

xx DIRECT EXAMINATION CONTINUED

BY MR. GRAND:

Q Mr. Goor, shortly before we broke for lunch, I asked you if the three quarter million dollar figure that you gave included an amount for facilities and equipment and I believe you answered yes.

I don't recall if I asked you how much of the three quarters of a million was attributed to such things. Can you tell us?

MR. BENBOW: Such things being?

THE COURT: Facilities and equipment, is that correct?

MR. GRAND: Facilities, testing equipment, rental of testing tracks.

A I think the number I have in mind is $100,000. I don't know if I mentioned it earlier or not. And it is included in the three quarters of a million figure.

Q Can you also tell us, please, what is the basis for the program you have testified about or from what that program is derived?

A Well, from previous experiences with similar

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systems, similar programs, rather, a number of companies--

MR. BENBOW: Objection, your Honor.

MR. GRAND: To the question or the answer?

MR. BENBOW: To the answer. It seems to me there is no basis in the record that he has worked on any similar programs or similar systems.

THE COURT: I think there is a basis. I will permit it. Go ahead.

A Principally the development at Kelsey-Hayes, also programs at General Electric and at Sweethart Plastics.

Q Can you tell me what relationship, if any, the program that you have outlined bears to the program that was employed at Kelsey-Hayes?

A The program in its nature was very similar.

MR. BENBOW: Does that include that it was at the same period?

THE COURT: I gather it is during his employment at these various places, is that correct, Mr. Goor?

THE WITNESS: Yes, sir.

MR. GRAND: Your Honor, at this point I tend to question Mr. Goor about the reasons stated by Singer in the course of this litigation as to why in Singer's opinion the Perma device was unmarketable or could not be made marketable. Those reasons are set forth in Plaintiff's Exhibit 122

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for identification and I offer it at this time. That exhibit consists of excerpts from Plaintiff's pretrial memorandum and a document entitled "Additional Reasons Rendering the Perma Anti-Skid Device Unmarketable."

THE COURT: I assume you are going to hand this up for solely my assistance and benefit. Is that what it is?

MR. GRAND: That's correct.

THE COURT: You are not vouching for the truth of the statements contained therein?

MR. GRAND: I am certainly not. On the contrary.

THE COURT: Mr. Benbow, do you object to it?

MR. BENBOW: No, your Honor, except that the first part of the exhibit is Plaintiff's pre-trial memorandum in an abbreviated form, and as long as it is clear that it is, I assume, part of the Court's record, plaintiff's pre-trial memorandum, and if there is need we will be free to refer to other parts, and the Court also, I have no objection other than that aspect of it.

MR. GRAND: Let me make clear what the purpose of the offer is. It is only to bring to the Court's attention the reasons that the defendant has articulated at various times.

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THE COURT: This is merely done in aid, correct?

MR. GRAND: That's correct. The first--

THE COURT: All right. It is received in evidence.

MR. GRAND: The first two pages of the exhibit are offered only to show what the document is, not so that our arguments will be accepted by the Court as they are written down.

MR. BENBOW: I do, however, your Honor, have an objectionto this line of testimony based on this exhibit, now that it has been received, as Mr. Grand just stated it a moment ago, and that is nothing has been shown that Mr. Goor has any direct experience of this device and these subjects get into the actual working experience with the device which Singer experienced.

Now, for Mr. Goor to have read documents about the device is no different from me having done it, and yet I don't feel prepared to testify about the workings of this device, and I don't see where Mr. Goor is qualified either.

MR. GRAND: I would add to that--

THE COURT: We will permit the line. You will have a continuing objection to it.

MR. GRAND: I would add to that only, your

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gather you have no view with respect to that statement?

MR. BENBOW: I object as leading, your Honor.

THE COURT: His answer is going to be he doesn't know what the reliability testing was, is that correct?

THE WITNESS: That's very correct, yes.

THE COURT: Okay.

Q Now, turning to page 2 of the second portion of this exhibit, do you have page 2 in front of you, the first item of which states the system was not failsafe, do you have that before you, Mr. Goor?

A Yes, I do.

Q Do you agree with that statement as it relates to Exhibits 2 through 5 before you?

A By my definition of failsafe that I gave earlier, I agree with it even though I think it could have been easily added ~~aided~~.

MR. BENBOW: Objection to the last part of the answer.

THE COURT: He does agree?

THE WITNESS: Yes.

MR. BENBOW: I move to strike the last part of the answer.

THE COURT: No, it is not necessary.

Q Is it your opinion that the device could have

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easily been made failsafe to--

MR. BENBOW: Objection.

Q To meet the definition you have described or the criteria you have described earlier in your testimony?

THE COURT: I'll overrule the objection. Go ahead and answer.

A I believe so.

Q The second statement, the system used a mechanical sensor which was insensitive and unreliable.

Can you tell me whether you agree with that statement as relates to Exhibits 2 through 5?

A I have no reason to believe that.

MR. BENBOW: Believe what, that--

THE COURT: Mr. Benbow, if you want to object, objection, but don't--

MR. BENBOW: That was an objection, your Honor.

THE COURT: Do you agree that there was the use of a mechanical sensor?

THE WITNESS: Yes.

THE COURT: Do you know whether that sensor was insensitive and unreliable?

THE WITNESS: To the best of my knowledge it should have been sensitive--it shouldn't be inherently too slow and too unreliable.

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Q Do the computer runs which are summarized in Exhibits 123, 4 and 5 give you a basis for an opinion as to the sensitivity of that sensor?

MR. BENSON: Objection, your Honor. It seems to me these two have not been related to each other. 123 through 5 are hearsay as to this witness in any case.

THE COURT: They are being taken subject to connection. I will permit [illegible]

THE WITNESS: [illegible]ill say they have added to my judgment, yes, and confirmed it.

Q The third statement is that the system used a centrifugal speed governor as a sensor although the wheel speed which the governor sensed had no relationship to wheel braking requirements.

Let's break that down piece by piece again relating to Exhibits 2 through 5.

Do you agree with the statement that the system used a centrifugal speed governor as a sensor?

A Yes, I do.

Q And do you agree or disagree with the second portion of that statement although the wheel speed which the governor sensed had no relationship to wheel braking requirements?

A No, I do not.

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However, there is a valid relationship, as Mr. MacDuff showed in his article, by sensing one set of wheels, you could control all four, which he recommended and therefore, I am sure that the relationship here also from experience of trying four wheel system at Kelsey-Hayes is quite valid.

MR. BENSON: Did you make clear that Mr. MacDuff was Singer's expert.

THE COURT: Sure.

MR. GRAND: Could we read the last portion of the answer back. I didn't hear it.

(Record read.)

Q When you say having tried a four-wheel system is quite valid, do you mean controlling four wheels from a single sensing unit is a valid thing to do?

A Yes. Well, at Kelsey-Hayes we made a number of tests, a large number of tests using the same controller that was used for the two-wheel system to control all four wheels and it functioned quite satisfactorily.

Q Turning to statement number 7, the Perma Sensing unit lacked the capability for sensing a differing road conditions and adjusting performance to such variable condition.

Do you agree with that statement, or disagree

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with it?

A Well, it would sense it to some degree in a rate of closure and opening of the centrifugal governor sensor which would be related to the speed of the wheels that would accelerate and decelerate differently when different road coefficients, so it does have some sensitivity to road coefficients and from our computer indications and others, the performance should be quite satisfactory within that range.

Q You are speaking of the system after it has been triggered by the cam, gear and microswitch?

A Yes, I was.

Q The statement number 8, the system used a single brake pressure modulating device, Perma-Vac, for all brakes on the vehicle in violation of certain state legislation mandating split braking systems. I gather you don't have an opinion on legal matters, is that correct?

A I would say yes, I cannot answer a legal question.

THE COURT: That's good. Everybody else around here thinks they can. Go ahead.

THE WITNESS: No, I can't.

MR. BENBOW: Does he know whether the system used a single brake pressure modulating device. The Perma-Vac with all brakes on the vehicle.

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this in light of his preferance, your Honor.

THE COURT: I will permit it. Go ahead.

A Fro my experience at Kelsey-Hayes--

MR. BENBOW: Objection to the continuation of the answer. The Kelsey-Hayes system was designed largely for the Ford device, not for the large variety of systems which the Perma device was designed for.

THE COURT: No, I will permit it.

A My experiences in Detroit with Kelsey-Hayes was that we could get vehicle information from all the manufacturers quite regularly by just calling in many cases.

MR. BENBOW: Your Honor, I object to that since Kelsey-Hayes is known to be a manufacturer for other equipment manufacturers.

The Perma Company was not.

THE COURT: How about the Singer Company?

MR. GRAND: I don't think we will have a denial that the Singer Company makes parts for the automobile industry nor will we have a denial that the Singer Company--

THE COURT: We will get to that part of it later.

Q The tenth statement, the Perma system could not, as intended by the inventor to be safely and properly integrated into the different braking systems of a broad variety of vehicle makes and models under the range of

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environmental and brake system conditions reasonably to be expected.

Do you agree or disagree or have a view with respect to that statement?

MR. BENSON: I object, of course, your Honor.

THE COURT: Yes, you have a continuing objection.

A I really don't think I can answer this. It is very broad. I find difficult--I don't know the stated intent.

With proper effort it probably could be but I really don't--can't say.

Q Ll, the Perma system could not produce under all road conditions stopping distances equal to or shorter than stopping distances of vehicles not equipped with the system.

Do you agree or disagree with that statement?

A Well, I cannot disagree with the statement because there would be some conditions such as loose gravel and loose snow where skid controls in general would not stop in shorter distances than would a system with locked wheels.

In addition, the mixed stopping distances, our computer runs show they can be either shorter or essentially very close, but in cases they may be slightly longer so the statement on its face is probably reasonably accurate.

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THE COURT: On page 4?

MR. GRAND: It is numbered page 4 of this exhibit I am sorry, I omitted one, your Honor.

Q Number 14, the system required a change in driver habits. Do you agree, disagree or have any view on that subject?

MR. BENDON: Objection, your Honor.

THE COURT: I will permit it. Go ahead.

A The system was designed to assist the driver in condition of panic stop. I really do not see how it would in any way alter the driver habits.

Q The next statement, C1, installation of the device on vehicles by persons other than the original manufacturers of the vehicles resulted in unreasonable hazards to the users of the vehicle.

I gather you can't express an opinion on that statement?

THE COURT: How can he?

THE WITNESS: I really cannot.

Q Statement number 2--well, the document is in evidence so perhaps you don't have to read it. Do you have any opinion with respect to C2?

A That again is a legal opinion on warranties that I am in no position to say anything.

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THE COURT: I don't know. We are going to find out. Let's hear the rest of the answer.

A In a Kelsey-Hayes unit we introduced an electronic control module, which was something new in industry, and therefore we felt that it was unwise to make it so that any dealers could tamper with it.

At the same time the configuration of the circuitry was proprietary, so we potted the unit so it could not be tampered with, which resulted in a necessity for total module replacement in case of failure.

Q 11, the need for extensive redevelopment of the Perma system reasonably indicates that even if such redevelopment were successful the cost of the Perma system would be so high as to be prohibitive to the ultimate user, thus rendering the Perma device unmarketable.

Do you have a view--

THE COURT: Objection sustained.

Q I would like, Mr. Goor, to show you Plaintiff's Exhibit 104 in evidence and direct your attention to the third paragraph therein. That paragraph deals with Singer's understanding of the word or the meaning of the word fail-safe. I would like you to read that paragraph to yourself.

Specifically, Mr. Goor, I want to direct your attention to the sentence that begins with the words "We do

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not regard a device as failsafe," that sentence.

A I just got to it.

Q Just so it will be in the record, the statement to which I am directing your attention is "We do not regard a device as failsafe unless failure of the device, regardless of cause or probable frequency of a particular type of failure, does not impair the utility of the underlying system to which it is connected."

MR. BENBOW: I object to the two qualifications in this regard, your Honor, if I understand the thrust of Mr. Grand's inquiry.

THE COURT: I don't know where it is going, but I will permit him to answer it.

Q In your opinion, Mr. Goor, does that state a standard that has ever been applied, to your knowledge, in the automobile industry concerning anti-skid devices?

MR. BENBOW: Your Honor--

THE COURT: If you know.

MR. BENBOW: I object.

THE COURT: You object and I overrule it.

If you know it, answer it.

MR. BENBOW: Could I spell out my objection, your Honor?

THE COURT: No.

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MR. BENBOW: All right.

A No, not that stringent.

Q Do you know of any device currently being marketed, any anti-skid device currently being marketed which meets that standard?

MR. BENBOW: Objection again, your Honor. It seems to me he has indicated--

THE COURT: That's all right.

I will let him answer it.

A No, I do not.

MR. GRAND: I have no further questions at this point, your Honor.

THE COURT: In view of the fact that we are going to take a substantial break, not through choice, but of necessity, I would suggest we not start cross examination today.

I know it gives Mr. Benbow a chance to bone up on his cross examination, but I am sure that he would not have finished it between ten minutes to 4 and 4:30 today.

Is that true?

MR. BENBOW: We are prepared to go forward, your Honor.

THE COURT: I am sure you are prepared to go forward. Do you think you will finish by 4:30?

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Q When did you first talk to Mr. Devilliers about the possibility of his running a simulation of the Perma anti-skid device for you?

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A I believe around August of 1973.

Q August of 1973?

A I believe so. I am not positive.

MR. LAGEMANN: I suggest we are, too, your Honor. I would like the witness to respond to the question. I asked him what his conversations about gear ratios were.

A The conversation about gear ratios was, well, they were very indirect, really -- Mr. Devilliers suggested to me that some documents showed -- and so did Mr. Perrino's testimony -- that the governor started to close at a given speed. Other documents showed that it closed, started to close at a different speed. So I asked Mr. Devilliers what would be the easiest way, without changing, in a simulation, such thing as governor weights and springs and other complex items, on a simulation, mind you, not in b4 practice; what would be the easiest way to change the closer rate and he told me it would be by changing the gear ratios, so I asked him to simulate the one that he finds in the documents and approximately what Perrino said, plus what the other documents seem to indicate, plus go one below that to see if there appears to be any spot where the system looks like it is better than others.

Q What is the gear ratio in the unit as depicted here, Plaintiff's Exhibit 5A?

A It can be any number of places.

Q Well, maybe we had better back up. What do you mean by gear ratio?

A The ratio from the speed of the cable rotation and the rotation of the cam gear.

Q In other words, when you speak of gear ratio of

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24 to 1, in Plaintiff's Exhibit 123, is the 24 to 1 the ratio between the rotational speed of the flexible shaft as it is labeled on Plaintiff's Exhibit 5A and the governor assembly weights or what?

A I don't recall. I think it's really the speedometer speed here versus the cam gear. I'm not too positive.

Q Let's nail this down, Mr. Goor. Is this it, this rotational speed from the adapter gear to the governor assembly, is that -- what is the gear ratio a ratio between?

A I believe it is from the rotational speed of the speedometer cable to the rotation speed of the cam gear.

Q Of the speedometer cable?

A Of the equivalent to the speedometer cable. I am not too sure. It is just a matter of changing these ratios here, and I don't really -- offhand, I don't see it is necessary for me to recall exactly which ratio. Basically what you do, by increasing the ratio between this and that (indicating), you change the closer rate because the governor will be rotating at a different speed in relation to the wheel of the car. That is really all I care about.

MR. LAGEMANN: Just so the record will be clear, it should reflect that when the witness said "Between this and that," he pointed to the gear box and to the governor assembly on Plaintiff's Exhibit 5A.

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THE WITNESS: And he also stated that basically all he cared about is the ratio between the speed of the wheel and that of the governor, really.

Q Very good. So let's just nail this down absolutely firmly. So when you speak of a 24 to 1 gear ratio, you are speaking of the difference between rotation, let us say, of the adapter gear,which is in a direct linkage to the speedometer cable, is that correct?

MR. GRAND: I object. He said between the rear wheel and the governor. He just said that.

Q Rear wheels or the adapter gear?

A I am not saying it is a 24 to 1 relation between the wheel and the governor. All I am saying, the only thing that counts is the ratio between the speed of the wheel and the speed of the governor rotation. What gears were changed specifically, Mr. Devilliers will tell you, any one of these gears could have been changed.

Q Then is it your understanding that the 24 to 1 ratio is the ratio between rear wheel rotation and rotation of the governor assembly as indicated in Plaintiff's Exhibit 5A?

A The only thing that I care about and that I indicated in this case is the fact that at that ratio the governor starts to close at a given speed.

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Q I am not asking what you care about, Mr. Goor. I am asking you what your understanding of the gear ratio is. Is it, Mr. Goor, the step-up or the ratio between rear wheel speed and the speed of the governor assembly as labeled on Plaintiff's Exhibit 5A?

A You want me to give it numerically, say the 24 is that ratio?

Q No, I am asking you is that what you mean by gear ratio. I know you used a different --

A By gear ratio, all I care about is the relationship between the speed of the wheel and that of the governor rotation.

Q That is what you mean by gear ratio?

A That is what I mean by the ratio that I am interested in.

Q On Plaintiff's Exhibit 5A, Mr. Goor, assuming this were hooked up to a car with a rear wheel on it, what would the gear ratio in this configuration as depicted in this exhibit be, if you know?

A I don't know offhand.

did you have any discussions with Mr. DeVilliers about the fact that although both vehicle models at Kelsey-Hayes and in Plaintiff's Exhibits 123 through 125 were based on the same vehicle, that the vehicle model in Plaintiff's Exhibits 123, 124 and 125 was not exactly the same as the one which you used in 1968 at Kelsey-Hayes?

A Oh, yes. What we have done is we discussed the possibility of what the differences would be. But on the other hand, we related --

Q Can you tell us what those differences are as related to you in your conversations with Mr. DeVilliers?

A I am trying to tell you the conversations, so please don't interrupt.

We discussed the fact that we have taken the same system that was simulated on a '67 Thunderbird and put it on many other cars, including older ventages, at Kelsey-Hayes, and the performance results were essentially the same, and therefore we discussed the fact that the '67 will more than likely be quite sufficient model simulation to indicate what the differences could have been.

Q Did you discuss what the changes between the model which you used in 1973 and the model which you used in 1968 were?

A I already told you that we didn't.

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Q How accurate are they? How close to real world performance would a simulation be?

MR. GRAND: It has been asked and answered. I will object.

THE COURT: He can answer again.

A Well, again, I never look at computer simulation on its own two feet. If I look at it in conjunction with other data, and it is close, I'd say it's very close, and if it's not, then I will try to find out what's wrong with it. In this case it's very close, and therefore I think it is valid.

Q Mr. Goor, nobody has ever run stopping distance tests with the Perma device on a 1967 or 1968 Thunderbird, have they? You haven't seen that kind of a test result?

A I don't think that is necessary. As I mentioned to you before, the Kelsey-Hayes system was designed for '67 and '68 and we put them on '65s and '64s and '66s. We put them on Cadillacs and Buicks and Oldsmobiles and Chryslers, and they function essentially in the same manner as they did on the system they are designed for, so therefore I must conclude that this is a valid result.

Q Mr. Goor, would you say that the width stopping distances of Plaintiff's Exhibit 123 are accurate within 5 per cent of what would really happen in a real stop with a

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an improvement with the system off, does it not?

A In a very consistent way at this stage of development, yes.

Q Mr. Goor, I thought you were telling us before we broker for lunch that you compared the accuracy of your simulations against these tests vis a vis the relationship of improvement or disimprovement with system on and system off stops.

A I think you misinterpreted what I said, Mr. Lagemann.

Q I may have.

A I will tell you what I said. I said that I had enough indication from enough test whereby there was an improvement in the order of magnitude indicated in the simulation.

I am here to judge if this system can or cannot function within a given set of parameters. Now, if under no circumstances the system would have functioned within those parameters I would have had to say that there is something inherently wrong with the system.

Inasmuch as enough test did show that it did perform in a manner not asimilar to what is shown in the simulation and inasmuch as many changes took place in the system between one test and another and inasmuch as none

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typographical error took place, any number of things. I will have to know more before I will decide if I want it rerun or not.

Q Mr. Goor, you testified on direct that there were a number of specific criteria that an anti-skid device had to satisfy in order to be marketable. Do you remember talking about those criteria?

A Yes.

Q As I recall, you specifically talked about seven criteria that an anti-skid device would have to meet.

Was the first criterion that the anti-skid device afford directional stability during panic stops?

A My best recollection would be that, yes.

Q Did the second criterion relate to stopping distances?

A Very likely. I don't specifically recall.

Q Was there a criterion that talked about or exists in connection with anti-skid devices relating to stopping distances?

A Yes.

Q Was there another and third criterion relating to the ability of the anti-skid to function in the automotive environment?

A Yes.

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Q Did the fourth criterion relate to reliability?

THE COURT: Was there another criterion that related to reliability?

A I don't know the order, but yes, there was a criteria regarding reliability.

THE COURT: Who cares about the order.

MR. LAGEMANN: The order is of no importance.

Q Was there another criterion, which would be fifth in this recitation, in any event, relating to the threshold of activation of an anti-skid unit?

A It is a criteria?

Q Yes. Do you recall such a criterion?

A Not as a criteria. You may have to refresh my --

Q Excuse me. I cannot hear you, sir.

A Not as a criteria. You may have to refresh my memory.

Q Was there a criterion at Kelsey-Hayes relating to the threshold of activation of an anti-skid unit?

A No, there was not a criterion for threshold.

Q Was there a criterion that the system should not become activated unless an impending skid was detected?

A Yes, there was.

Q Was that determined by the threshold of activation of the unit?

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A Generally speaking, yes.

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Q What else would have to do with detecting impending skids?

A I thought the criteria was that it should not activate the skid control unless there was an impending skid. You said what else could detect impending skid. That is not related, really.

Q The threshold of activation.

A No, those two terms --

MR. GRAND: The two of you are not communicating.

MR. LAGEMANN: That may be our problem, Mr. Grand. Let us resolve it.

MR. GRAND: Yes.

Q Mr. Goor, what in the Kelsey-Hayes system determines when an impending skid is present?

A It detects the deceleration of the wheel.

Q Is there a deceleration at which the Kelsey-Hayes system will become activated?

A Yes, there is.

Q I believe we said it is in the neighborhood of 1.2 G, right?

A Later we said, yes.

Q I think you later agreed it was 1.2.

A That's right.

Q Is that the threshold of activation of the Kelsey?

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A Approximately.

Q So, is there a criterion relating to the threshold of activation of anti-skid units?

MR. GRAND: Object, your Honor. We are really just talking semantics.

THE COURT: I think that is about all we are, at this point.

You call the criteria one thing; he calls it a different thing. I know what he is talking about. I don't particularly want to get into the semantics.

Q Was there a criterion relating to failsafe?

A Yes, there was.

Q Was there also a criterion relating to the fact that an anti-skid should have no adverse effect on other automotive systems such as the electrical and vacuum systems?

A Yes, there was.

Q Would an anti-skid system satisfying all seven of these criteria which you have discussed be marketable?

A You just told me earlier I was not a marketing expert, so I really can't answer that.

THE COURT: Go ahead and answer it anyway. You answered the last time. Answer this time, too.

A Probably would have.

Q Probably?

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A I don't have a crystal ball that looks back, but my belief is that it might have been.

Q Mr. Goor, transcript page 2450, you were asked by Mr. Grand, "Now, based on your experience that you have described at Kelsey-Hayes in the development of these criteria, is it your opinion that an anti-skid device which satisfies these criteria would be marketable generally in the automobile industry?"

And then there were some objections and you answered on the next page, page 2451, "At that time, from the feedback we had from various manufactures, I think this would have been an acceptable marketing criteria."

Do you recall that testimony?

A Yes.

Q So, let's see if we can agree generally; would an anti-skid system which met all seven of your criteria that you discussed on direct and we have reiterated here, be marketable?

A You are asking for my opinion now, right?

Q Yes.

A From the feedback I had at the time, I think it would have been, yes. First question you asked me was not an opinion, it was just a blank statement. This one you are asking for my opinion.

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Q Were these seven anti-skid criteria industrywide? In other words, were they part of all companies manufacturing anti-skid devices?

MR. GRAND: I'm sorry, I think there is a lot in there that is not in evidence. Can we have that read back?

(Question read.)

MR. GRAND: I don't know who is manufacturing anti-skid devices in 1964 and '5. Object to the question.

THE COURT: No, I will permit it. Is this the seven criteria used by people in manufacturing an anti-skid device?

THE WITNESS: I say when I was involved, yes.

THE COURT: Okay.

Q Were the seven criteria which you specified the only criteria for marketable anti-skid systems?

A To the best of my recollection, offhand, yes.

Q Were they the only criteria at Kelsey-Hayes?

MR. GRAND: At what point in time?

MR. LAGEMANN: When Mr. Goor was there.

A It was the criteria against which we were developing our system.

Q Were there any other criteria?

A I don't recall offhand any major criteria.

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Q Wouldn't monetary considerations affect what performance criteria you could put into an anti-skid system?

A Yes, it would.

Q For example, I think you mentioned that there are no anti-skid systems for automobiles that measure slip directly, and the primary reason that no systems do that is because of the cost?

A That is one of the major reasons, yes.

Q In fact, isn't the cost of manufacture a marketability criteria in all manufacture, including anti-skid?

jkh6 Goor-cross

A In everything I have been involved in it had something to do with it, yes.

Q Was there a criterion at Kelsey-Hayes that the

Goor-cross

Q Have you seen the printouts of these computer runs which form the Plaintiff's Exhibits 123, 124 and 125?

A No, I have not.

Q You have not?

A No.

Q Mr. Goor, do you know what a split braking system is?

A Yes, I do.

Q Would a split braking system have a dual master cylinder?

A Yes, it would.

Q Would each of the two chambers in a dual master cylinder be connected to a separate brake line?

A Yes, they would be.

Q Now, in the earlier split braking systems, was one of the two lines connected to the rear brakes and was the other of the two lines connected to the front brakes?

A In some of the early systems, yes.

Q Do you recall seeing Plaintiff's Exhibit, I believe it was, 2A, which was the cutaway of the dual Permavac?

A Very generally, yes.

Q All right. Did that dual Permavac have two hydraulic cylinders?

A It appeared to have, yes.

Q How many vacuum pistons did that dual Permavac have?

A A single vacuum piston.

Q Were both of the plungers which fit into the hydraulic cylinders attached to the same Permavac piston

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Q Did Mr. Devilliers tell you in the computer simulation with the 24 to 1 gear ratio, which is Plaintiff's Exhibit 123, that the front wheels would be turning on some surfaces over one-half of the time?

A Yes, he made a statement to that nature.

Q What were the front wheels doing, presumably something less than one-half of the time, when they were not turning?

A Well, they would be-- presumably they brake to some degree most of the time, slip of various levels, while you are stopping a vehicle.

Q Mr. Goor, if the wheels are not turning while the vehicle is in motion or stopping are they locked?

A If they are not turning and the vehicle is in motion?

MR. GRAND: I don't understand this, your Honor, because it assumes that for half the duration of the stop without interruption the wheels are locked and I don't think there is any exhibit that establishes that.

THE COURT: That is all right. Go ahead, finish the question.

Q Mr. Goor, when the wheels were not rotating what were they doing? Were they locked?

A I presume if they are not rotating they must be

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locked.

Q Would you look at the next statement on page 3 of Plaintiff's Exhibit 122, Mr. Goor, which states that "The system's cycling frequency was inherently too low."

I believe your response was -- correct me if I am wrong -- that this statement was not applicable because the Perma system did not cycle but modulated brake pressure, is that correct?

A That's one of the reasons, yes.

Q Mr. Goor, when you state that the system was not a cycling system what is your interpretation of the word "cycle"?

A Well, I suppose generally speaking in this case it would be an off and on system.

Q And what do you mean by off and on system?

A A system that locks completely and then comes up to full release of the brakes.

Q Are you saying that an off-on system would be a system in which the wheels would be alternately locked and unlocked, locked and unlocked during a stop?

A Essentially, yes.

Q You are saying that your understanding of the Perma system is this did not occur when the Perma system was in operation, is that correct?

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Q You were also asked questions yesterday about the dual Perma-Vac and a split line braking system.

Do you recall that?

A Yes, I do.

Q Do you recall beingasked --

MR. BENBOW: What page are we at?

MR. GRAND: Let's try 2846.

Q The question is:

"Q And by putting two sets of hydraulic cylinders with plungers on a single Perma-Vac did the Perma system control both sides of a split braking system from a single modulator?

"A In a manner of speaking, yes."

Then skipping a little, the question is:

"Q If there were a failure in the Perma anti-skid which caused the vacuum piston to stay in its retracted or brakes off position, would both the front and rear brakes in a split braking system be impaired?

"A With that design, probably, yes."

Do you recall that?

A Yes, I do.

Q Is there an obvious solution to that problem, if it is a problem?

MR. BENBOW: Objection, your Honor.

Q In your judgment?

THE COURT: Go ahead, answer it.

A I personally would have put two parallel Perma-Vacs in the system.

Q Mr. Goor, would it be more expensive to manufacture a Perma anti-skid device having two Perma-Vacs as opposed to one?

A I would say so, yes.

work in support of engineering design, particulary in the area of disc brakes, I have done simulation and analysis work in support of automotive skid control.

In this activity I have become quite -- I guess the word would be utilitarian in the use of the computer as an every day engineering tool. I have worked both -- primarily in the automotive and the plastics industries, with some experience in aerospace, some in -- well, I guess I am not quite sure what my co-op employer would be termed, what industry he is in, that is. He also had some automotive work too.

Q In connection with your work do you program computers?

A Yes, I do and have.

Q What is your present involvement with computers?

A I use them in a day to day support basis of analytical work. Also I apply them in the area of manufacturing. I guess that basically describes it. It is an engineering tool to me, much like a slide rule is.

Q Are you a member of any professional societies?

A Yes. I am an associate member of the American Society of Mechanical Engineers and an associate member of the Society of Automotive Engineers.

Q Are you connected with Goor Associates, Inc.?

Q In connection with your work there, have you used a computer?

A Yes, I have used a computer as an analytical tool. By analytical tool I mean I carried out, you might say on paper what the problem was that I wanted to solve. Like this vibration problem I just described. I used a computer just to carry out the figures. That is not simulation, strictly speaking. It is using it for analysis. I have used it for simulation of the cooling processes, in the molds, the containers we make, the motivation being if you can cool them faster, you can make more containers in the same amount of time.

In particular, I might add that the major simulation that I did in that area was more than just, you know, to help run that particular product faster. It was to determine how to design the tooling in the first place, you know, because they anticipated a problem in that area, so it was sort of a similar type of work as I do in supporting machine design, but here I was supporting tooling design.

Q Would you describe to us briefly your professional and educational background?

A Yes. I have a Bachelor's degree in mechanical engineering from the University of Detroit. I have a Master's

BY MR. DE RENSIS:

Q Did you develop knowledge concerning automobile skidding and the nature of its control at Kelsey-Hayes?

A Yes, I did.

Q Can you tell us how you developed such knowledge?

A In the same way that I learned about vehicle dynamics. I studied the problem. Then, after doing that, in conjunction with doing that, I read what was written. It didn't take too long.

Q Was Kelsey-Hayes working on an anti-skid device while you were employed there?

A Yes, they were.

Q What role, if any, did you have with respect to the Kelsey-Hayes anti-skid program?

A My role was primarily to learn to develope and gather fundamental information as to what the problem was all about, I mean, beyond what was already written down, and while I think that there was a lot known previously, the older information was developed when computers weren't available to carry out the simulations and analyses that were available, you know, available say in the early '60s there.

I am talking about information developed back in the '20s or something like that.

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When they got into that problem there was a lot to be learned just of the physics of the thing. So what I did was to simulate the vehicle itself. You know, there were several of us involved in this over a period of time. This was done between us by writing the equations of motion of the vehicle. The equations of motion of the vehicle are written simply by representing parts of the vehicle as physical quantities.

For instance, the body of the vehicle is frequently referred to as a sprung mass, like a mass, a block, the springs as springs, the shock absorbers as damping devices, the wheels as rotating inertias, this sort of thing. The body of the car itself, I might add, has a moment of inertia, rotating mass, whatever you want to call it.

One use these quantities. Using the laws of physics one can describe the vehicular system in terms of mathematical equations, called differential equations. One also has to include, for instance, the relationship between the tire and the road, which information was available then, largely developed empirically. One includes that in the model.

So we first got that simulation to work, on the computer, that is. To do this, I might add, the role

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of the computer againn, even though we are talking simulation, is really just a big calculator.

These particular equations that were developed, to reduce them to the resulting motions of the vehicle that you are interested in is not a direct process. It is just not solving something algebraic. It requires what you call numerical methods.

We happened to use the Runge-Kutta fourth order method of numerical integration. This I might add is very standard. I am just giving this for the record.

MR. BENBOW: Could I hear the previous question?

THE COURT: The previous question? Sure. I assume you want the answer too.

MR. BENBOW: I am more interested in the question. I think I heard some of the answer.

(Question read.)

MR. BENBOW: Your Honor, I think I move to strike the answer as nonresponsive. It seems to me he is talking a good bit about computers and things that were done by simulation and little of this goes to any knowledge of anti-skid devices or what Kelsey-Hayes was doing with respect to anti-skid other than in a most theoretical sense.

THE COURT: I will permit it. Go ahead.

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Next question.

I don't even know if the previous answer was completed. Was that your complete role at Kelsey-Hayes?

THE WITNESS: No. I was being very expansive on the whole thing, your Honor.

THE COURT: Go ahead.

THE WITNESS: I will try to accelerate this. Maybe that's the problem.

THE COURT: You don't have to. Go ahead.

A Basically we carried out the process of simulating the vehicle on the computer. We can get into the technologies involved later if you desire.

After doing that I developed hypothetical -- one of the things you do is to develop hypothetical control technique, which you can do on paper, then model it as I described, integrate the model into the vehicle model, and you can see what is going to happen or likely what is going to happen and you can explore the problem. This is what we did.

Since Kelsey-Hayes was working on such a system they needed this kind of information to feed back and forth with the day to day development work that was going on because they didn't really understand precisely what was happening and why. I don't think anybody else did either

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I said, is a division of the American Cup Corporation.

Q Is that the company by which you are presently employed and about which you testified previously?

A Yes.

Q You mentioned computer simulations or computer models of a vehicle.

Can you tell us what the simulation or model of a vehicle consists of?

A Well --

MR. BENBOW: Objection, form. It is two questions.

THE COURT: Go ahead, answer it.

A As I began to describe at an earlier question, one can view -- the vehicle is a physical system, a real world physical system. It has weight, it has springs in it, et cetera, it rools along the ground, it obeys the laws of physics. Therefore, one can use the laws of physics to model the thing.

Since the laws of physics can be expressed or are expressed mathematically, this allows one, therefore, to write a system of mathematical equations, which we call a vehicle model.

I might add this is nothing new, nothing remotely new.

Q During the course of your work at Kelsey-Hayes

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A Or partly closed.

Q What is the effect of a partly open or a partly closed switch? What does that do?

A Well, as I just said, by the switch being partly open or partly closed it allows the Perma-Vac to move part way in its travel, to -- there is a maximum amount of vacuum can be let through or zero -- to let half the amount through, and the amount of brake reduction is proportionate to that amount.

Q Does the system, the Perma system, have a fail-safe feature?

A Yes. The fail-safe feature is that if the driving cable of the governor were to fracture the governor would come to a stop, but that -- assuming that we enter a skid control situation in the first place, that is, where the solenoid has been retracted, the governor would come to a full stop, it would then collapse completely, it would then remove the brake pressure, but as soon as the brake pressure fell below the pressure switch setting the system would be taken out, out of action, and there would be no way for it to come back into action again because the governor doesn't speed up again, the microswitch can't be reactivated.

Q What would happen if there was an electrical interruption?

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MR. BENBOW: Objection.

THE COURT: I will permit it. Go ahead.

A If there was an electrical interruption -- I ass u- you are referring to effect on such things as the solenoid. If there were an electrical i- ruption the solenoid would be deactivated, its spring would force it into an extended position. This expands the governor weights fully and allows full brakes, gives full brakes.

Q What would happen if there was an interruption of vacuum?

A If there was an interrupti- of vacuum the brakes couldn't be removed. You know, on this equipment that is in front of me, you couldn't have any brake modulation occur.

Q So that your normal brakes remain?

A Yes.

MR. BENBOW: I object, your Honor, to these questions without reference to what time phase these theoretical electrical or vacuum interruptions occur.

MR. DE RENSIS: Your Honor, I showed Mr. De Villiers certain models, certain schematics, certain patents, which I think fairly accurately describe exactly what we are talking about.

THE COURT: All right.

Q Based on your study of the Perma anti-skid device, can this invention control skids, in your opinion?

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jkh 1 De Villiers-direct

T5 2 Q Can you tell us what does the model of the simulated vehicle consist of?

A Yes. It consists of a representation of the vehicle's mean body, the part we ride in, which we refer to as the sprung mass. It consists of representations for the wheels, representations for the springs and for the shock absorbers and, as I mentioned this morning, we write the physical equations of motion for all of these components with the constraint that they are connected together as they would be to form a car.

Then we -- well, we wound up with a set of equations of motion, general equations of motion with which one had to now give values to these various weights and springs and lengths, etc.

Q Just to clarify something here, are you saying that the dynamics of a vehicle can be reduced to mathematical equations?

A Yes, I am saying that.

Q Are you saying that you, in fact, did so reduce the dynamics of a vehicle to mathematical equations?

A Yes, I am.

MR. DeRENSIS: Could we have marked for identification 132?

xx (Plaintiff's Exhibit 132 marked for identification.)

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Q Mr. De Villiers, I would like to show you what has been marked Plaintiff's Exhibit 132 and ask you if you can identify that document.

A Yes. This document contains our vehicle model in terms of equations of motion.

Q The vehicle model that we have been talking about here?

A Yes.

Q Did you prepare Plaintiff's Exhibit for identification 132?

A Did I prepare this?

Q Yes.

A Yes, I did this work, if that is what you mean.

MR. DeRENSIS: Your Honor, we offer this.

THE COURT: Have you had a chance to look at it yet?

MR. BENBOW: We just saw it for the first time, your Honor.

MR. DeRENSIS: Your Honor, we would like to transfer the sticker to the original.

THE COURT: The one that is readable?

MR. DeRENSIS: The one that is readable.

THE COURT: Okay.

(Pause.)

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MR. BENBOW: I have a preliminary objection to this document, while they are looking at it, which I would like to state.

It seems to me the witness, granting all the expertise that he or his counsel has claimed for him, has done little or nothing to verify that this technique, b2 in fact, is applicable to these kinds of systems.

I don't think there has been any clear statement on the record that all possible variables with respect to such a system are taken into account by these alleged mathematical formulas, and if they do, with what degree of preciseness or precision they duplicate a system which the witness admits he has only applied this technique to in the year 1971, some seven years after the events in question.

There has been no demonstration that these techniques were available, or available in this way at the time period in question.

For all of these reasons, and partly in order to try and spare all us the burdens of this kind of exhibit and this kind of testimony, I would offer that preliminary objection to its admission.

(Pause.)

BY THE COURT:

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Q Go very slowly with me on this. All right?

On the second page, under the general La Grange equations of motion, this is a standard equation, is that correct?

A Yes, it is a standard equation, generalized equation.

Q Okay. You have written it out to read d over dt, right?

A Yes.

Q Parentheses dt over --

A That is partial of capital T with respect to capital Qi dot.

Q Close parentheses, minus dT over d.

A That's a partial derivative sign, not a d.

Q Okay. So we will call it partial derivative, okay?

A It should be more as on the top.

MR. GRAND: If the problem is simply one of clarity, your Honor, perhaps we ought to withdraw it so the court reporter isn't put through this.

THE COURT: Off the record.

(Discussion off the record.)

THE COURT: Let's go back on the record.

Plaintiff's Exhibi. 132 for identification has

been cleaned up.

Are you agreed that you have a copy you can read now?

MR. BENBOW: Yes.

BY THE COURT:

Q Let me ask you this, sir: This Plaintiff's Exhibit 132 for identification basically is a general vehicle equations motion, is that correct?

A Yes, what is called bicycle type vehicle, looking at it in a fore and aft direction.

Q Would these general equations be found in a general physics book? I am not talking about general physics, something that you are going to be taught in high school. I am talking about --

A It might feasibly show up as a problem in the exercises. However, I would have to say that those equations can be derived by more elementary methods than that La Grange method that I used, but it is more difficult, more complicated, more cumbersome algebraically, so in that sense, I think it probably wouldn't likely show up as an exercise in the general physics book, but where it could show up is in a university advanced dynamics book and in technical literature, SAE papers and the like. It is a very classical bit of automotive engineering analysis, I believe. The

general gist of it has been detailed for detail, vehicle dynamics.

MR. BENBOW: Your Honor, I have best evidence problems with this proposed exhibit, too. It is clear that actual tests were conducted with the Perma device, and at the time there were photographs extant of the way in which it operated or did not operate, and why we should be compelled to have advanced engineering, which I admit to very limited knowledge of, your Honor, if any, it seems to me completely unnecessary and unduly burdensome of this record.

MR. DeRENSIS: Your Honor, itis not the best. It is different. These are different ways of looking at the same thing. This is an analytical tool.

THE COURT: I am aware of that. Don't worry about it.

MR. BENBOW: Different andless accurate, I maintain, your Honor.

THE COURT: It might be. Okay.

b3 Are you about to start on this now?

MR. DeRENSIS: Yes.

THE COURT: The construction of the program, I assume, is what your next topic is?

MR. DeRENSIS: No; some more relating to numbers

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that are put into those equations.

THE COURT: Okay.

MR. DeRENSIS: In other words, those are just generalized equations for any vehicle. There are some numbers that he put into that to make it a specific vehicle. We want to get into that.

THE COURT: Okay.

All right, go ahead, put the numbers in.

MR. DeRENSIS: Your Honor, have you accepted that document in evidence?

THE COURT: No, not yet.

Go ahead, put the numbers in anyway.

BY MR. DeRENSIS:

Q Mr. De Villiers, in connection with these equations, did you insert any numbers, that is, numerical constants?

A Yes, I did.

MR. DeRENSIS: Could we have marked as Plaintiff's Exhibit 133 a document entitled Numerical Constants Used in Vehicle Simulation.

MR. BENBOW: Your Honor, I am forced to point again to my request at pages 2508 and 2509 of the record, where I asked for the backup material that was going to be used with Mr. De Villiers. It seems the court has been imposed on this afternoon in having to have documents clarified

on this record that are not even legible, and there are insufficient copies, and we are being presented with what, to me, are highly complicated mathematical materials that I requested three months ago and that apparently have been available to plaintiff for a considerable period of time.

THE COURT: All right.

MR. DeRENSIS: Your Honor, he requested tapes. We delivered the tapes to him some time ago.

THE COURT: Computer tape?

MR. DeRENSIS: Yes.

THE COURT: Okay.

MR. BENBOW: I didn't limit my request to tapes.

xx (Plaintiff's Exhibit 133 marked for identification.)

THE COURT: All right, gentlemen, we are going to take an early break today so I can reread this delightful testimony of this afternoon early in the morning.

Come back here at 10 o'clock, please.

MR. BENBOW: Thank you, your Honor.

(Adjourned to April 4, 1974, at 10 A.M.)

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PERMA RESEARCH & DEVELOPMENT COMPANY
v.
THE SINGER COMPANY

April 4, 1974,
10:20 A.M.

(Trial continued)

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A N D R E L. De V I L L I E R S, resumed.

MR. BENBOW: Your Honor, back in January I had requested Mr. Grand to give us some backup material on Mr. De Villiers during the course of the break. I referred to that yesterday,I think twice on the record. I have received certain limited additional material from Mr. Grand last night, and I have asked him this morning if he has anything additional for me by way of backup, and I have been told that he does not.

It would seem to me there should be additional backup, but I just thought this ought to be on the record, in any case.

THE COURT: All right, go ahead.

MR. BENBOW: Your Honor, there is a problem of clarification of these numbers still on 132 that the court helped us with yesterday, but the numbers on the front do not appear to be clear to us, under the formula on the first page.

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Could we get it clarified?

THE COURT: Why don't we go off the record and bring it up here. Bring the original up, too.

MR. BENBOW: Thank you, your Honor.

(Discussion off the record.)

MR. DeRENSIS: As a preliminary matter, I reviewed the transcript last night of Mr. De Villiers' testimony. First I would like to say the reporters did a very good job on very difficult testimony, but I think ther is a mistake appearing on page 2950. There is a question which reads in the record:

"Does the pressure switch serve a control function at high speeds?"

Now, my recollection was that I asked the question, "Does the pressure switch serve a control function at low speeds?"

It appears to me to have been transposed in the recording.

Indeed, the next question, which was meant to follow that question, says: "Can you describe your analysis of its function at low speeds?"

I am afraid the record as it stands now makes the answer erroneous to the question that is on the record.

THE COURT: You mean the question at line 3?

MR. DeRENSIS: The question at line 3.

THE COURT: Do you want to change it to "low"?

MR. DeRENSIS: I would like to change it to "low," if that is agreeable to counsel for the defendant.

MR. BENBOW: That is agreeable.

THE COURT: Sure. Okay.

MR. DeRENSIS: I would also like to clarify a few points before we proceed with the discussion of the mathematics.

DIRECT EXAMINATION CONTINUED

BY MR. DeRENSIS:

Q At page 2961 of the transcript, Mr. De Villiers, I asked you, "Is there such a thing as an average coefficient of friction and such a thing as a sliding coefficient of friction?

"A Well, I think the sliding -- yes, there is a sliding coefficient of friction.

"Q Can you tell us what that is?

"A Okay."

I would like to ask you if you can tell us what an average coefficient of friction is?

A Yes.

Q Would you do so?

A Yes, I will.

MR. BENBOW: Objection, your Honor, unless it is to establish that the witness knew this as of yesterday.

THE COURT: I will permit it.

b2

Go ahead.

A The sliding coefficient of friction does not necessarily have to be constant all the way down through the stop and on certain types of roads, and particularly when the road is rather wet, at the higher speed -- and I am talking now about the case in which there is not any skid control, necessarily -- there the vehicle's wheels are locked and it is just sliding --

MR. GRAND: Slower.

MR. BENBOW: While he is stopped, it seems to me the answer is non-responsive. He is talking about sliding. He was asked about average.

THE COURT: I know.

Go ahead.

A At this higher speed the coefficient of friction, for instance, is likely to be lower. However, as the vehicle decreases in speed, the coefficient of friction is likely to increase.

Now, this is going to produce some resulting stopping distance for the vehicle. Now, one can go backwards from that, with a relatively simple formula, and compute an

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apparent or average coefficient of friction which was occurring over that run, over that stop.

Q Can you tell us what that formula is, if you know it?

A Yes. It would be the square of the vehicle's velocity divided by twice the stopping distance and also divided by gravity, gravitational constant.

Q In other words, an average coefficient reduces a varying figure to a constant figure?

A Yes, a constant or a mean figure, I would say. Mean and average are sort of synonymous.

Q Now, at page 2959, I asked you:

"Could the modification of the rear wheels of an automobile by the Perma anti-skid device have the effect of locking and unlocking the front wheels of that vehicle?"

You answered, "Yes," and you went on to give an explanation.

In connection with that answer, I would like to show you Plaintiff's Exhibit 19, which is the White report, and in particular page 8, the three pictures on the right top right-hand column of page 8, and ask you whether the phenomenon you described of locked and unlocking front wheels could have caused broken skid marks such as are depicted in these photographs?

MR. BENBOW: Objection, your Honor, speculation.

THE COURT: No, I will let him answer.

Go ahead.

A Okay. Particularly in the middle photograph I would say that that could be possible.

THE COURT: Now, look, you have got to keep your voice up.

The answer was, "Particularly in the middle photograph, that could be possible."

THE WITNESS: That could be possible, yes.

Q Mr. De Villiers, at page 2967 of the transcript you were asked by the Court, "Would these general equations be found in a general physics book?"

He was referring to the general vehicle dynamics equations.

In your answer you said, "It is a very classical bit of automotive engineering analysis, I believe."

Could you tell us what you meant by a classical bit of engineering analysis?

MR. BENBOW: Objection.

THE COURT: I will permit it. Go ahead.

A Well, it is classical for the first reason in that it applies the Newtonian laws of physics actually, which are very, very old.

Secondly, cars have been basically built structurally the way they are now for many, many years, 30, 40, 50 years, and a technical person 50 years ago knowing physics could just as well have written those equations as somebody today.

Q So that that bit of engineering analysis would have been available in 1964?

A I certainly --

MR. BENBOW: Objection.

THE COURT: I will permit it. Go ahead.

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You believe it, right?

THE WITNESS: Yes, I believe that it could have been done in 1964. In fact, I am sure that it was done in some places.

Q Yesterday we broke when we were discussing Plaintiff's Exhibit 132, I believe. Plaintiff's Exhibit 132, just to refresh everyone's recollection, were the general equations of motion for a vehicle, is that correct?

A Yes.

Q Are these equations the ones that you used at Kelsey-Hayes?

A Yes. That is basically the same model. In fact, it is really the same model.

MR. BENBOW: At what time, if we could know.

Q At what time?

A 1966.

Q Can you tell us the dynamics of what elements of an automobile are covered by these equations?

A Yes. It depicts the motions of the sprung mass, the unsprung mass, the rotation of the wheels, the connections between the sprung mass and the unsprung mass, all of the motions induced herein due to braking, I might add, in the strictly fore and aft direction. We are not talking about sideways motion or anything like that.

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A Yes, I did.

Q Are those the same numbers that were used by you at Kelsey-Hayes?

A Yes.

Q During the course of your employment at Kelsey-Hayes?

A Yes, we used those there.

Q Do these numbers relate to any particular vehicle?

A Yes. They make the model dynamically similar to a 1968 Thunderbird, Ford Thunderbird, that is.

Q Did you also make a simulation of the Perma anti-skid device?

A Yes, I did.

Q And what does that simulation consist of?

A It consists of a representation of the Perma anti-skid device and its components and their connections, and in an analogous manner to which we model the vehicle itself, the same basic approach is taken to physically model the Perma anti-skid device.

Q Again, are you saying that the operation of the Perma anti-skid device can be reduced to mathematical equations?

A Yes, I am.

Q And in fact you derived mathematical equations to

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represent the device?

A Yes, I did.

Q How did you derive those mathematical equations?

A Again, I did so by applying the laws of physics to the components of the Perma system.

MR. DE RENSIS: Could we have this marked as Plaintiff's Exhibit 134 for identification, a copy of which was given to the defense last evening.

(Plaintiff's Exhibit 134 marked for identification.)

Q Mr. De Villiers, can you identify Plaintiff's Exhibit 134 for identification?

A Yes.

Q What is it?

A It is my modeling of the Perma system.

Q This document contains equations which are your representation of the Perma system?

A Yes.

Q In connection with your modeling of the Perma system did you also derive certain numerical values which you have referred to as constants with respect to the Perma device?

A Yes, I did.

MR. DE RENSIS: Could we have this marked for

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identification as Plaintiff's Exhibit 135, a document entitled "Numerical Constants In The Simulation Of The Perma Anti-Skid Device."

(Plaintiff's Exhibit 135 marked for identification.)

Q Does Plaintiff's Exhibit for identification 135 contain the numbers that you used in your simulation of the Perma anti-skid device?

A Yes, this document contains numbers which I used in developing my simulation.

Q Does the exhibit also describe the source of those numbers?

A Yes, it does describe sources down through the page.

Q Is this exhibit a document prepared by you and I jointly in order to put in one convenient place all the applicable numbers?

A Yes, it is.

Q How did you derive these numbers?

A I did so by studying the drawings and the Singer document mentioned there, taking dimensions off of them, weights that were written down on the drawings, densities, et cetera, and computing them, in some cases just picking them off directly.

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Q Can you tell me how a company in 1964 or 1965 could acquire a model of the Perma device such as contained in Plaintiff's Exhibit 134?

A By taking the same drawings and the same information, writing the same equations.

Q Were the mathematics available in 1964-65?

A Yes, they were.

Q Was your mathematical model of the Perma device as contained in Exhibit 134 together with 135 then combined with your model of the typical vehicle, which are contained in 132 and 133?

A Could you repeat this question, please?

(Question read.)

A Yes, that is correct.

THE COURT: Let me see if I can break it down.

In doing this computer analysis you took the formula found in Plaintiff's Exhibit 132 and you put that in the computer first, is that correct?

THE WITNESS: In the sense of time that the various work was done, but to produce this model they all had to go in there together.

THE COURT: I am talking about in the sense of logic rather than the sense of time.

THE WITNESS: Yes, sir. In the sense of logic you

have to have the vehicle model first.

THE COURT: Once you get the formula in a sense of logic then you put in the numbers, right?

THE WITNESS: Yes.

THE COURT: Thereafter you put in the Perma equations 134, is that correct?

THE WITNESS: Yes.

THE COURT: And thereafter you put in your constants listed in Exhibit 135, is that right?

THE WITNESS: Yes.

THE COURT: In fact, did you put all these items into the computer?

THE WITNESS: Some of them went directly into the computer, others were used to derive inputs that went into the computer, and in some cases those numbers wound up being computed back, or something close to them.

BY MR. DE RENSIS:

Q But in some way 132, 133, 134 and 135 are combined together, is that correct?

A Yes, structurally, logically, in terms of carrying out the work.

Q In what way were these combined?

A Well, we had the vehicle model and we had it already implemented in the sense of a computer program written

to carry out the numerical calculations to produce the motions of the components of the vehicle. We then wrote what is called the subroutine to do the same with the Perma system. We then put the subroutine into the main computer program which represented the vehicle via this model and the resulting combination model, program, et cetera, now represented the vehicle under the control of the Perma system, and the various numbers either were inserted directly in as data or in many cases, the total of which I don't remember right now, they were used to compute input data.

But in one way or another they were represented.

Q After all these equations were combined with the constants were a number of speed and road surfaces selected?

A Yes. I might add that implicit in this model, you know, there had to be a friction model for the road. So that was in there too. We selected a number of speed and road surfaces, as you asked.

THE COURT: You don't really mean you selected a number of speed and road surfaces. The coefficient of friction, is that what you are talking about?

THE WITNESS: You see, the friction characteristic of a given road is it is an equation which we mentioned yesterday is experimentally derived or found and that equation is also, you know, in the model.

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Q Did Mr. Goor tell you certain speeds --

MR. BENBOW: Objection as leading.

THE COURT: No. Go ahead.

Q -- certain speeds and certain road surfaces to be used in connection with this model?

A Yes. He asked me to run stops, simulated stops, that is, on a various number of roads, road sufaces, representable by the friction model for each road, and he also asked me to run stops on those roads starting from certain speeds.

Q With the selection of the speed and road surfaces were the equations solved?

A Yes, they were solfed. That is what the model does. The model solves these equations numerically.

Q What role, if any, did the computer play in solving those equations?

A The computer played the rol of carrying out the numerical calculations necessary to solve or, that is, bring out the desired resulcing information out of the model.

Q In other words, the computer serves to make your calculations for you?

A Yes. The algorithm or technique through which the equations are solved, or putting it a different way, in which the desired information is extracted from the

model, this technique is a highly repetitive arithmetic exercise, and while in theory -- and I do say in theory -- it could be carried out by hand, I doubt anybody would ever consider it to do with such a model as this.

And so the computer carries out the task of simply doing those myriad number of calculations.

Q Was any specific mathematical method used in solving these equations?

A Yes, the one I mentioned yesterday, the fourth order Runge-Kutta numerical integration technique was used and implemented to carry out this method, to carry out this solution.

Q Did computer capacity exist in 1964 to allow such use in solving these equations?

MR. BENBOW: Objection.

THE COURT: If you know, go ahead and answer it.

A Certainly, in my opinion it was there.

MR. DeRENSIS: May we have marked for identification a sheaf of papers entitled Simulation of Perma Anti-Skid Device as Plaintiff's Exhibit 127.

(Plaintiff's Exhibit 127 marked for identification.)

MR. DeRENSIS: Would you mark another sheaf of papers entitled Simultation of Perma Anti-Skid Device as Plaintiff's 128, and finally a third sheaf of papers entitled Simulation of Perma Anti-Skid Device as Plaintiff's Exhibit 129?

MR. BENBOW: I don't understand this, your Honor. I thought 127 had already been marked.

We have it right here.

MR. LAGEMANN: We have it.

(Pause.)

(Plaintiff's Exhibits 128 and 129 marked for identification.)

BY MR. DeRENSIS:

Q Mr. De Villiers, I want to show you what has been marked Plaintiff's Exhibits 127, 128 and 129 and ask you whether you can identify what these documents are. Let's take them one at a time. Can you tell us what 127 is?

A Yes, that is the summary, the first page, and the remaining pages are Xerox copies of the computer printouts of a series of stops, summarized on the first page.

Q Is the same true of 128?

A Yes, and of 129.

Q Do those tapes that are attached to that summary sheet--

MR. BENBOW: Could we get some identification as to which is which?

MR. LAGEMANN: Your Honor, there is some confusion, at least in our mind, as to is 127 with the 24 to 1 gear ratio -- that we do know -- but the others, we would like some clarification as to which exhibit number --

THE COURT: It is on the front.

MR. DeRENSIS: 128 has a gear ratio of 12 to 1 and 129 has a gear ratio of 18 to 1, and they correspond

to Plaintiff's Exhibits 123, 124 and 125 of the same order respectively, with one exception, and that is on the stop at 60 miles an hour at .5 the distance for a stop without the device is recorded at 188.2 as opposed to the numbers in 123, 124 and 125 of 180.7.

It is simply a typographical error.

THE COURT: Okay.

Q Do the tapes that follow the summary pages in plaintiffs Exhibits 127, 128 and 129 constitute the computer's numerical solutions to the equations described?

A Yes, they do.

Q Let us look at 127 for a moment.

Would you look at the second page of 127. That is the first page of computer printout after the summary sheet.

Can you tell us what those columns mean? There are a series of columns, are there not?

A Yes, there are.

Q Can you tell us what those columns mean?

A The columns are a specific value in time, they represent a time trace, you might say, for a number of parameters in the model.

For instance, the first column going down the left-hand side of the page is time in seconds.

THE COURT: The first column is time in seconds, correct?

THE WITNESS: Yes; the second column is distance traveled by the vehicle in feet.

b2

THE COURT: The second column is distance traveled by the vehicle.

In each column we are starting with the second line, right? The first one says .1000. The second one is .0 again, right?

THE WITNESS: Yes.

THE COURT: All right.

Now, the third column, again the second line, we are starting with the number 88.

THE WITNESS: Yes.

THE COURT: What does that stand for?

THE WITNESS: That stands for 88 feet per second which is 60 miles an hour.

THE COURT: All right. The fourth column, which is .05, what does that stand for?

THE WITNESS: That is deceleration of the vehicle in g's, units of gravity.

THE COURT: Deceleration in units of gravity, right?

THE WITNESS: Yes.

THE COURT: Okay.

MR. BENBOW: Could we go slower now, your Honor, so we could get these as we go along?

THE COURT: Sure.

MR. BENBOW: Thank you.

THE COURT: All right.

THE WITNESS: The next column is the braking talk in foot pounds.

THE COURT: Braking talk in foot pounds?

THE WITNESS: Yes,applied to one front wheel or to each front wheel is a better way to say that.

THE COURT: All right. Now, the next column, where again the first number is 88.00?

THE WITNESS: That column represents the speed of one front wheel in feet per second.

THE COURT: Okay. Now, the next column, which is .00?

THE WITNESS: Yes, that is the acceleration in g's of one of the front wheels. I say acceleration as opposed to deceleration.

THE COURT: All right. Your next column is what?

THE WITNESS: That is the slip of one of the front wheels.

THE COURT: All right. Then the next column again is 88.00.

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THE WITNESS: Yes. The next three columns represent the same set of numbers but for the other front wheel which, in this particular simulation, those will be duplicates because the car was running on a uniform road.

THE COURT: Okay.

THE WITNESS: In other words, there wasn't ice on one side and concrete on the other or something.

THE COURT: Let's get to the next one.

THE WITNESS: The next column now is the talk, brake talk in foot pounds applied to one rear wheel.

The next, the speed of a rear wheel, acceleration of a rear wheel, and the slip of a rear wheel.

And then the last three columns are the same.

MR. LAGEMANN: Your Honor, could we have a moment?

THE COURT: Sure.

MR. LAGEMANN: I wonder if the witness could be asked to run through those three again more slowly?

MR. DeRENSIS: Will you run through those again?

THE COURT: We will do it a different way.

The last three columns again?

THE WITNESS: The last three columns are respectively the speed in feet per second, the acceleration in g's and the slip of the other rear wheel.

THE COURT: All right.

Now, the first line, is that a line that is used by you for identification of the test?

THE WITNESS: Yes, that represents --

THE COURT: Of the computation of the test.

THE WITNESS: Yes, that represents some of the input data and some computer data that is relevant to the entire stop that is printed out.

For instance, the first number, 3,000 there, is the maximum brake ~~tarh~~ torque, you might say, sought when the driver puts his foot down, for one front wheel.

The next number is the speed, is the wheel speed in miles per hour, correspondent to when the governor is fully collapsed.

The next number after that is the --

THE COURT: You have got to go slower.

MR. LAGEMANN: Your Honor, may we also request he identifies the numbers before he tells us what they represent so we may get it correctly?

THE COURT: Sure, okay.

The wheel speed where the governor collapses is 4.0, right?

THE WITNESS: Yes, miles per hour.

THE COURT: Okay.

THE WITNESS: The wheel speed that the governor is

fully expanded at is 5.9 miles per hour. That is the number 3.

THE COURT: Hold it.

All right, let's get to the next one.

THE WITNESS: The next number is the thing we have been referring to as the gear ratio, 24.0. That is the ratio of the speed rotationally of the governor to the rotational speed of the rear wheels, average rotational speed, from one side of the car to the other. The number 98.6 --

THE COURT: Hold it, hold it.

Okay, 98.6, what is it?

THE WITNESS: This represents the square root of the ratio of the stiffness of the little center spring of the governor to the square root -- let me put it this way: the square root of the ratio of the stiffness of the center spring of the governor to the total of the masses represented by the flying weights within the governor. It is what is called a natural frequency.

THE COURT: All right, the next number, .030.

THE WITNESS: .030 is the time constant in seconds of either the solenoid or the Perma-Vac -- I'm not sure which one, you know, from memory.

Putting that differently, the next three numbers

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there represent respectively the time constants of the Perma-Vac, the solenoid and the decel sensor which is the cam gear arrangement, and the one for the decel sensor is .02; the Perma-Vac and solenoid each are .03 seconds.

THE COURT: When you say the decel sensor, you are really talking about the micro switch, right?

THE WITNESS: Yes, the micro switch.

THE COURT: The delay involved in that?

THE WITNESS: Yes, in the simulation. The .51 is a -- I'm not sure whether it is -- well, all right, if somebody can refer to Exhibit No. 134 I can say what the .51 represents.

THE COURT: Sure, go ahead.

THE WITNESS: It represents when the governor is collapsed, this little number 1, that little length 1 times the cosine of the angle theta, when the governor is collapsed that comes out to be .51.

Q You are referring to a drawing at the top of page 1 of Exhibit 134?

A Yes, I am.

.39 represents approximately, in inches, the precompression of the spring in the governor.

MR. BENBOW: Could we get that again?

THE COURT: The precompression of the spring in the

governor.

THE WITNESS: Yes. In other words, it is the force or it is the number of inches the spring is compressed just to put the governor together.

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MR. BENBOW: That was incomprehensible to us.

THE WITNESS: I will try again. To put the governor together one has to squeeze the spring, just to put the governor together, put the sensor together, one has to squeeze it approximately three-eighths of an inch, which is the .39.

MR. LAGEMANN: Which springs are we referring to?

THE WITNESS: The center spring of the governor, of the sensor.

THE COURT:Is this the spring that you are referring to (indicating)?

THE WITNESS: Yes.

MR. DeRENSIS: Could you describe it for the record?

THE COURT: Sure. Located inside the sensing unit is the governor which consists of flying weights. The governor has a spring inside of it which causes the weights to collapse when they are not being held out by centrifugal force.

Go ahead. What's the next number?

THE WITNESS: The next number represents the opening pressure -- I guess that is not the way to say this. When

the brake pressure is rising, it is the number of foot pounds on the front wheel at which the pressure switch will close and activate the system.

We speak in terms of foot pounds of ~~talk~~ torque produced on the front wheel as opposed to pressure that produces it.

THE COURT: All right.

What is the next one, 150, right?

THE WITNESS: Yes. That is the same quantity, but rather, when the pressure is falling, that is the number of foot pounds at which the pressure switch will open, deactivate the system.

THE COURT: All right. Hold it.

Okay?

MR. LAGEMANN: Yes, your Honor.

THE COURT: .92.

THE WITNESS: .92 is what has been referred to as the threshold of the system. It is in g's. It is approximately the deceleration necessary of the governor to cause the micro switch to activate.

THE COURT: Next one, 700.

THE WITNESS: 700 is the split point of the proportioning valve of the vehicle's brakes in foot pounds on the front wheel.

THE COURT: Okay.

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THE WITNESS: It is a pseudo pressure.

THE COURT: All right. .344.

THE WITNESS: Yes. .344 is the -- when a proportioning valve is being used, when the pressure is below the split point, then the pressure going to the rear wheels will be the same as that going to the front wheels.

After the split point, however, the rate of increase of the rear wheel pressure with respect to the front wheel pressure is .344.

THE COURT: All right.

THE WITNESS: The number 20.0 represents the value in degrees of the angle theta when the governor is collapsed.

THE COURT: All right. Now, I note that on this copy in front of me that you have a pencil notation .75. What does that mean?

THE WITNESS: I am trying to remember.

MR. BENBOW: Is that theta on Plaintiff's Exhibit 134 you were referring to?

THE COURT: Let me get an answer to my question first.

THE WITNESS: I'm afraid I can't remember that right.

MR. DeRENSIS: Could that be the coefficient of friction for that stop?

THE WITNESS: Let's see what we have got on the other ones. Strangely enough, it doesn't show up on any other page here.

MR. GRAND:Yes, it does. Four pages or six pages in I see a .75.

THE WITNESS: I'm afraid I don't know what that number is.

THE COURT: All right.

Now, would you be good enough -- we are going to take a break -- I want you to confer with the two gentlemen here who are engineers and experts in this field, run over the same things with them to make sure that they understand; okay?

THE WITNESS: Yes, I will.

THE COURT: Thank you. All right, let's take 10.

(Recess.)

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MR. DE RENSIS: May I proceed?

THE COURT: Yes. Let me just check on one thing. Does everybody have the identification of the numbers now?

MR. BENBOW: We think we have it, your Honor.

THE COURT: All right.

BY THE COURT:

Q The columns of numbers, starting with the first column, the first one is 0.00, right?

A Yes.

Q The second one down is 0.05?

A Seconds.

Q And then the third one is 0.1?

A Yes.

Q This column actually is the amount of time as it passes, is that correct?

A Yes.

Q Your second column, 0.0 is your distance, right?

A Yes, the distance the vehicle is traveling as all this is happening, starting with 0 at that point.

Q As you go down the column you end up with 158.5?

A Yes.

Q 158.5 represents --

A The number of feet the vehicle traveled.

Q Until it stopped?

A Well, specifically, until it got to .142 feet per second, at which point we stop the run. You get into trouble at the very end computationally dividing by zero and the like.

THE COURT: All right.

BY MR. DE RENSIS:

Q Mr. De Villiers, let me backtrack a second. Let's look at 127.

There is a sheet of paper followed by a second sheet of paper with about an inch and a half of lettering on it, is that correct? Is that second page part of the first page?

A Yes. That is an extension of the first page. It is part of the first run.

Q Is the third page a separate run?

A Yes, that's a new run.

Q Does this exhibit contain a number of simulated stops of a vehicle by application of the brakes?

A Yes.

Q And each of these tapes represent what is happening in those columns over time, is that correct?

A Yes.

Q The time from the beginning of the stop, which is recorded at zero, to the end of the stop?

A Yes, the end of the stop, as mentioned earlier, when we stop simulation, which might be something under two feet per second.

Q But it is uniformly stopped for all the tapes?

A Yes, that was the cutoff point on all simulations.

Q Turning to the first page, that is, the first page of tapes, not the cover sheet, Plaintiff's Exhibit 127, when we are looking at the third column we are talking about the speed of the vehicle, are we not?

A Yes.

Q As we read down the column we are talking about the changes in speed of the vehicle?

A Yes.

Q The first figure is 88 feet per second, is that correct?

A Yes.

Q That is equivalent to what speed in miles per hour?

A 60 miles per hour.

Q So that is it fair to say that the first page of tapes that we are referring to is a simulated stop of a vehicle from 60 miles an hour?

A Yes.

Q The last number in column 2 I believe you said was the distance traveled, is that correct?

A Yes.

Q So that at 60 miles an hour when the brakes were applied would it be fair to say it took 158.5 feet to stop?

A Yes.

Q Are there a number of tapes here which show the Perma system in operation and some tapes which show the Perma system not in operation?

A Yes. Some of the sheets show stops under the control of the Perma system, others show the same stop but run without the effect of the Perma system.

Q The first page that we are looking at, that is, the first page of tapes in Plaintiff's Exhibit 127, is that a stop with the Perma device?

A Yes, the first page is a stop with the Perma device.

Q Turning to the third page, again, looking at the third column, what speed is the vehicle going at in miles per hour?

A Beginning again at 88 feet per second or 60 miles an hour.

Q Does the third page consist of a stop at 60 miles an hour without the Perma system?

A Yes.

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Q Again, does the last number in the second colum represent the amount of distance the vehicle traveled to come to a stop from 60 miles an hour without the Perma system?

A Yes.

Q If you look at the top row of numbers on page 3, that is a stop without the Perma system.

If you look at the 11th number in that top line, the number 3,000, can you tell me what that number represents?

A I was on the wrong page. You are now referring to --

Q The third page of tapes.

A Okay. That number represents a setting for simulation purposes of the opening pressure for the pressure switch at the same pressure that we are applying the brakes to go to, so that the pressure switch will never activate on the simulation, that is, and hence produces a stop without the effect of the Perma system.

Q In other words, the pressure switch setting is set so high that the pressure switch never is --

A Never opens.

Q Never is closed?

A Never closes, for simulation purposes. You just use the same model to do both jobs.

Q Can you identify the cover page to this exhibit, that is, Exhibit 127?

A Yes. The cover page is a summary of the stops contained in the tapes beyond it.

Q In other words, the first tape that we were looking at, the one at 60 miles an hour that took 158.5 feet to stop, that is the first row of numbers?

A Across that page, yes.

Q And the tape that began on page 3 of the exhibit, which took 160.8 feet to stop, does that also appear on the cover sheet?

A Yes, that appears as the far right hand number on the first line.

Q In other words, if we look at the tape that begins on page 1 and continues to page 2 and we compare it to the tape that begins on page 3 and continues to page 4, do these represent simulated stops of a vehicle at 60 miles an hour and a .75 surface with the device and without the device in operation?

A Yes.

Q Can you describe to us the difference between Plaintiff's proposed Exhibit 127, 128 and 129?

A The three exhibits represent the same set of stops run but with different gear ratios, gear ratios as

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I have defined earlier, ratio between the speed of the governor and the speed of the wheels.

Q Again, let's look at Exhibit 128 and let's look at the first page of tapes, not the first page of summary, but the first page of tapes, and particularly the first line of numbers across the top of that page.

A Yes.

Q Can you tell me what difference there is between 128 and 127 in terms of numbers?

A Yes. You mean the very first line?

Q Yes.

A On --

MR. BENBOW: Your Honor, if I may try to save the Court's time and my time, given the limited relevancy of this line of testimony, do we have to go into this in this kind of detail?

THE COURT: I don't care. I know what it stands for. I don't think you have to go any further than that.

MR. DE RENSIS: I want to explain where he records the difference in gear ratio.

THE COURT: All right.

A Numbers 2, 3 and 4 going across are the collapsed speed of the governor, the full expanded speed of the governor, you know, wheel speed according to such, and the

gear ratio.

THE COURT: The same thing would apply in 129, is that correct?

THE WITNESS: Yes, sir.

THE COURT: Otherwise, other than that, all columns in 128 and 129 represent the same items as in 127.

THE WITNESS: Yes.

Q Again, in 128 and 129 each of the columns means the same thing as you described for 127?

A Yes.

Q Mr. De Villiers, you mentioned before that you also put into this model a friction slip curve of some kind.

A Yes. The friction slip curve is inherent to modeling a vehicle stopping on a road. It represents the quality of the surface in terms of how it can be used to stop the vehicle.

One friction slip curve represents ice, another one represents a very dry road, maybe dry concrete, something else represents an asphalt or dry concrete road with water on it, but they all have the common characteristic to them which is what we described yesterday in terms of the peak value, a value of friction which is developed when the wheel is locked and sliding and another value is a peak value in the 15 to 20 per cent slip area.

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On some roads the entire curve, namely the peak and the sliding value and those in between tend to vary as the stop progresses, and this particularly occurs, as I think I mentioned, on a wet road, in which the whole magnitude of friction developable increases as the car slows down, the effect of the water decreases. So we have a model here representing the friction slip relationship and its speed variability where applicable, and this is integral to the simulation.

Q What was the source of those friction slip curves?

A SAE papers and other literature, also long association with the subject.

T5 Q These friction slip curves are empirically measured, are they not?

A Yes, they are.

Q Going back a minute to 127, the first page of tape runs, what is the relationship between the numbers on the first line and the numbers that we have referred to in Plaintiff's Exhibits 133 and 135?

A I guess I don't understand the question.

Q The question is what is the derivation of the numbers on the first line of Plaintiffs Exhibit 127, that is, the first page of tapes, and 135 and 133?

A These numbers printed at the top of the page are printed out after, in some cases, some computation was done with input data, so they are not 1 for 1.

Q In other words, you derived some numbers from Plaintiff's Exhibit 135 and 133 or computed some numbers?

A Yes, and they are internal to these numbers, you know, after some preliminary calculation.

Q What do you mean by internal to? I am not clear that I understand the semantics, how a number is internal to another number.

A Well, these numbers on Exhibit 135 were used in computations which produced some of these numbers at the top of the page.

Q Can you give us an example and make it clear?

A Okay. The number 98.6 uses the total of these weights which we didn't actually calculate here.

THE COURT: The total of the weights shown on Plaintiff's Exhibit 135, right?

THE WITNESS: Yes. One has to do some calculations with the numbers on Exhibit 135 and use the drawings to actually produce the weights which go into ultimately producing that number.

THE COURT: The calculations are done using the formulae set forth in Plaintiff's Exhibit 134 for identification, is that correct?

THE WITNESS: Not quite. Well, to get the weight of something, if one knows its density, one would take its dimensions off a drawing, compute the volume times the density is equal to the weight, and this is the way these numbers were used. Although the cam gear threshold shows up directly there, for instance.

MR. DeRENSIS: Plaintiff would like to offer now in evidence Exhibits 127 through 135.

THE COURT: I assume you object to them, right, Mr. Benbow?

MR. BENBOW: I do, and I would like to state an objection to one or two of them.

jkh 3 De Villie s-direct

THE COURT: Sure.

MR. BENBOW: I notice on 135, for example, it doesn't seem to reflect the full computations which the witness has made. We are being offered 135 as some kind of selection out from his computations and there are a few missing steps. We don't know what else has been computed and, of course, the basic objection, I think, is as to relevancy, your Honor.

THE COURT: Okay. Mark them all in evidence.

That includes 131 now, is that correct?

MR. DeRENSIS: No, not 131.

MR. GRAND: How are you going to use it?

MR. DeRENSIS: I have to identify that as a Singer document received from Singer in the course of discovery.

THE COURT: I don't care.

xx (Plaintiff's Exhibit 133 received in evidence.)

xx (Plaintiff's Exhibit 134 received in evidence.)

xx (Plaintiff's Exhibit 135 received in evidence.)

xx (Plaintiff's Exhibit 127 received in evidence.)

xx (Plaintiff's Exhibit 128 received in evidence.)

xx (Plaintiff's Exhibit 132 received in evidence.)

xx (Plaintiff's Exhibit 133A received in evidence)

xx (Plaintiff's Exhibit 129 received in evidence.)

xx

(Plaintiff's Exhibit 13 received in evidence.)

A Singer description of the system, one of the ones I read.

Q Plaintiff's Exhibit 131?

A I believe it was this one, where I read that.

Q Is that what you are referring to?

A Yes. This I am quite sure is where I saw them use that term.

Q Incidentally, Mr. De Villiers, have you done anything to confirm the validity of your simulation?

MR. BENBOW: Objection.

THE COURT: No, let's find out, if he can answer it yes or no.

MR. BENBOW: It assumes validity, your Honor.

THE COURT: Go ahead. Answer it anyway.

A I am trying to think what I have done in that area.

MR. LAGEMANN: I'm sorry, we couldn't hear that.

THE COURT:He said he was trying to think.

MR. LAGEMANN: I didn't hear, your Honor, from here.

A The validity of the vehicle simulation, I was exposed to experimental vehicle simulation results -- not simulation, actual stopping results in which the data was recorded many, many times.

THE COURT: That was at Kelsey-Hayes, right?

THE WITNESS: Yes.

THE COURT: That is the same vehicle?

THE WITNESS: That we are using now.

THE COURT: All right.

THE WITNESS: As far as the Perma system, it is rather -- you know, we don't have any hardware that works and you can't build something up. I believe it to be valid. That is the best I can say. It corresponds with what I have gotten in conversation with the developers of the Perma system.

Q You haven't tested a Perma device?

A No, I have not. I couldn't. Nobody could very easily.

Q You haven't tested it in the sense you haven't attached it to a vehicle and run stopping distances on it?

A That is absolutely correct.

MR. DeRENSIS: Could you read back the answer that Mr. De Villiers gave to the question, "Had you confirmed the validity of your simulation?"

(Record read.)

Q When you said you can't build it up and you don't have hardware that works, were you referring to the fact that you weren't able to attach a Perma device to a vehicle and run stopping distance tests?

MR. BENBOW: Objection, your Honor.

THE COURT: I will permit it.

MR. BENBOW: This is so leading --

THE COURT: That's all right. Go ahead.

A It's very simple. I was not in any position to run a test program of the Perma system.

Q You mean a vehicle stopping distance test?

A Vehicle stopping test; build up cars, put the equipment on there, go out, rent test tracks, spray equipment to put the water down, ice rinks.

Q Mr. De Villiers, in your testimony you referred to, I believe, a proportioning valve in connection with 127, 128 and 129.

b4 Can you tell us what a proportioning valve is?

A Yes, it is part of the vehicle. It is supplied by the vehicle manufacturer and it serves the function in cases where the structure and the design of the vehicle call for it of making the vehicles braking system adhere as closely as feasible or possible to the brake distribution curve which I described yesterday.

Q It is not part of the Perma system?

A That is correct. It is part of the vehicle, supplied with the vehicle by the manufacturer or the supplier to him, usually.

A I would say that it depends on what one means by repair and maintenance. If I were in the business of supplying such a unit I think I would probably use the Sears Roebuck approach, in which you take it off, you turn it in and get a rebuilt one, and they do the work on a bench. That shouldn't be any big thing. And it has got to be cheaper than a new one.

Q So that the repair and maintenance does not necessarily have to be --

THE COURT: He has answered it. Go ahead, next question.

MR. DE RENSIS: I have nothing more, your Honor.

THE COURT: All right.

MR. BENBOW: Your Honor, could I just make clear that my objections went to this entire line of questioning on this document?

THE COURT: Oh, sure, absolutely.

All right. Let's take ten minutes.

MR. BENBOW: Your Honor, do you think it might be more expeditious if we adjourned for the day? I don't know what your pleasure is in that regard, but it seems to me that much of this testimony came in today and it is technical in nature. I just thought it might be expeditious --

THE COURT: Let's see if we can't kick it off today,

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get a little start.

MR. BENBOW: All right.

(Recess.)

MR. LAGEMANN: May I proceed, your Honor?

THE COURT: Go ahead.

CROSS EXAMINATION

BY MR. LAGEMANN:

Q Mr. De Villiers, do you have Plaintiff's Exhibit 122 before you?

A Yes, sir, I have that.

Q Would you please turn to the third page of that document, which is labeled page 8.

A I have it.

Q We will be referring to statement A, which reads: "Engine stalls resulted in vacuum loss and brake line pressures below specifications," referring to the Perma system, of course.

Did your computer simulations have anything to do with engine stalls?

A No, they did not.

Q Did your computer simulations have anything to do with vacuum loss?

A No, I didn't concern myself with that.

Q Did your computer simulations use the same

brake pressure figures in each run?

A I guess I don't understand.

Q If you recall, on the printouts --

A Oh, you mean applied pressure?

Q Yes, that is correct, applied brake pressure as put into the system by the driver.

A Yes. For all the stops we used a standard 3,000 foot pounds, and I might add the reason for that is because that is the way it was done in the standard testing at Kelsey-Hayes, put on as maximum pressure for every stop.

Q Was that 3,000 foot pounds approximately 1,200 pounds per square inch in the brake lines?

A That assumes a brake which -- approximately, but, you know, I am not going to tie that to fact. That is one reason I didn't use pressure directly. I decided since we are dealing with pressure and torque, and it is torque that stops the wheel, not pressure, and pressure and torque are essentially proportional to each other, I decided not to get involved with that aspect of it.

But it is about 1,200, 1,250, something like that.

Q I believe you mentioned a 50 pound variance. Would that --

A Yes.

Q If we are assuming disk brakes as opposed to drum

brakes it would vary between 1150 psi and 1250 psi?

A That depends if they put what is called a metering valve up in the disk brakes, which they generally do, at least nowadays -- I don't know what they did then -- so that the full sets of brakes would essentially start to act at the same time, in particular where they had drum on th[illegible]ear and disk on the front.

Q Did you use the same figure, once again, somewhere between 1150 psi and 1250 psi, in all of the computer simulations?

MR. DE RENSIS: Your Honor, I object because he didn't use those figures. He used 3,000 foot pounds.

THE COURT: Which is approximately the same amount, right?

THE WITNESS: Yes. If he means it in that vein --

THE COURT: Yes. All right.

Q Mr. De Villiers, if the system were in operation, the Perma system, and there were a vacuum loss while the Perma-Vac piston were withdrawn or retracted from its normal or brakes on position, what force would tend to restore brake pressure upon that contingency?

A The ~~exprssed frame~~ compressed spring.

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jkh 1 De Villiers-cross

T4 Q Would there be any other forces tending to restore brake pressure in such a contingency in the Perma unit as depicted in Plaintiff's Exhibit 5A?

A If there was a vacuum failure?

Q Yes.

A If there was a vacuum failure, the Perma-Vac would see it, in the same sense as if the rotary valve was repositioned and that would restore the brakes, and needless to say, the driver might even take his foot of the brake, possibly.

In that case, when he put it back on, he can feasibly get more brakes, that is, if he did not have a maximum application in the first place.

Q Mr. De Villiers, I am showing you Plaintiff's Exhibit 98B in evidence, and I am turning to the last page of that document which is entitled Failsafe Modification Transfer Valve.

If the Perma system had a transfer valve as depicted on the right-hand side of that page and there were a vacuum loss, would the same forces, being the force of the Perma-Vac spring, tend to restore braking pressure?

MR. DeRENSIS: I object because this seems to be going far afield from the area of direct testimony.

THE COURT: That is all right. I will let him answer

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if he can.

A I didn't concern myself with the transfer valve in my simulations. I assumed in my simulations a picture just like what is in front of me here.

b2

THE COURT: Which is Exhibit 5A.

Q Maybe I should backtrack. Have you reviewed this document in the course of your studies?

A Yes, I have. I am aware of the transfer valve, but I didn't get overly concerned about it.

MR. DeRENSIS: Would you speak louder?

A I am aware of the transfer valve but I didn't get overly concerned with it because I knew I wasn't going to worry about it and I didn't need to consider it in the simulation.

Q I am showing you schematic number 2 in Plaintiff's Exhibit 98B, and I am directing your attention to the right-hand side of that page which is entitled "Original Design."

Does that drawing depict the top portion of a hydraulic cylinder and plunger and check valve which is similar in design to the same component found on Plaintiff's Exhibit 5A?

A This picture here?

Q Yes, the picture under the label "Original Design."

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A Yes, I believe it does.

Q Keeping in mind the notation "without vacuum 500 psi" on the top of that page how much brake pressure could the Perma-Vac spring restore in the event of a vacuum loss with this hydraulic cylinder configuration? In fact, you might read the entire document. In addition, this first paragraph in here, which contains the notation, "without vacuum pressure cannot exceed 500 psi."

MR. GRAND: Where does it say that, "cannot exceed"?

THE COURT: I don't know.

Q The middle of the paragraph labeled "Theory," there is a paren and inside that paren it says, "without vacuum pressure cannot exceed 500 psi."

A Does that assume anything?

Q It assumes, I believe, Mr. De Villiers, that there is no vacuum.

MR. DeRENSIS: Your Honor, I think he is assuming a transfer valve and a modified Perma device with a larger bore piston to arrange for larger pressures.

MR. LAGEMANN: Very well.

Q Let us continue in the assumption that we are using a one-half inch diameter plunger within that hydraulic cylinder.

THE COURT: Let me see that.

(Pause.)

THE COURT: All right. Can you answer that question without making any computations?

THE WITNESS: If I want to assume the numbers which are written down here --

THE COURT: All right, go ahead, assume the numbers.

Q When you say "here," sir, do you mean in Plaintiff's Exhibit 98B?

A In front of me, yes.

MR. DeRENSIS: It seems to me there is some confusion between the Perma device as in 5A and the Perma device as we are referring to here in Exhibit 98B.

I am not sure it is clear to this witness or has been contained in the question exactly what the differences are here, and what he is being asked about those differences.

MR. LAGEMANN: The only question before the witness, your Honor, is how much pressure could be restored by the force of the Perma-Vac spring in the event of a vacuum loss with a one-half inch plunger in the hydraulic cylinder.

MR. GRAND: In a unit with the transfer valve?

MR. LAGEMANN: With or without.

THE WITNESS: With or without?

Q We are assuming a one-half inch plunger.

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A I probably would have to make some computations. I think I understand that-- I mean--

MR. DeRENSIS: Your Honor, I further object on the grounds that there has been no foundation laid to show this witness the Perma device with that kind of modified piston so that he can familiarize himself to the extent of testifying about it.

THE COURT: Yes. Besides that he can't answer it until he makes computations.

Q Have you made any such calculations with respect to a half inch plunger, Mr. De Villiers?

A No, I did not get into that area.

Q Mr. De Villiers, what was the diameter of the plunger in the hydraulic cylinder in the Perma device as depicted in Plaintiff's Exhibit 5A, if you know?

A I don't know.

Q Mr. De Villiers, I am going to show you a copy of Plaintiff's Exhibit 23 which, as I recall, you stated that you looked through in the course of your simulations.

I apologize for not having paper clipped the pages, but there are drawings in there labeled PV-2B and PV-1B.

Would you look at those drawings and tell us what the diameter of the hydraulic piston is in the Perma

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device as depicted in Plaintiff's Exhibit 5A?

b3 A How am I supposed to find PV?

Q I don't know. We were trying in the back of the room ourselves.

A I see. So the witness gets that job.

THE COURT: Here, give it to me.

(Pause.)

THE COURT: This is PV-2B; this is PV-5.

Have you got them?

MR. BENBOW: Thank you, your Honor.

Q Mr. De Villiers, looking at the two drawings labeled PV-5 and PV-2B, in Plaintiff's Exhibit 23, can you tell us what the diameter of the plunger is?

A The dimension says it is three-eighths in diameter.

Q Mr. De Villiers, would a three-eighth inch plunger, assuming the same spring force in the Perma-Vac, be able to restore more brake pressure in the event of a vacuum loss?

A Yes.

Q Do you know how much more brake pressure it could restore, Mr. De Villiers?

A It would restore it in the inverse ratio of the diameters, the square, rather, of the inverse ratio of

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the diameters of the two pistons. Because the area is less, this thing has less area, so therefore the same force puts in more pressure.

Q Applying the formula that you have just given us, Mr. De Villiers, could it restore 1,200 psi?

MR. DeRENSIS: I object to 1,200. There has been no foundation whatever for 1,200.

THE COURT: Let's find out.

MR. BENBOW: The witness laid the foundation for 12,00.

THE COURT: Oh, please, come on now, Mr. Benbow. Let Mr. Lagemann do the examination.

A Assuming that it originally would do 500 psi, no.

Q Approximately how many psi could it restore?

A Oh, about one and a third times 500.

Q Which would be approximately how many psi, sir?

A Well, about 650, 675, something like that.

Q So in the configuration, Mr. De Villiers, utilized in your computer simulation, if there had been a vacuum failure, the driving pressure being exerted by the driver in your simulation would not be restored to the brakes, is that correct?

MR. DeRENSIS: I object to that because that is--

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THE COURT: Sustained.

Q Mr. De Villiers, would you take a look at page 8 on Plaintiff's Exhibit 122 again and direct your attention to statement number B thereupon which reads: "The vacuum at slow automobile speeds was inadequate to prevent slight lag in operation of the invention."

What is your understanding, Mr. De Villiers, of the term "lag" as it is used in statement B in Plaintiff's Exhibit 122?

A I would interpret it to mean that whoever wrote this down is saying that it would take slightly longer to remove or replace the pressure or to relieve the pressure at hand. In other words, they are saying that at slow speeds, and hence lower vacuum, that it would take longer for the Perma-Vac to reduce the brake pressure.

Q When you say reduce the brake pressure, sir, do youmean reduce the brake pressure down to the point which would cause the pressure switch to openly holding circuit which in turn would cause the system to disarm, as it were?

A Reducing brake pressure wherever. Reducing brake pressure is reducing brake pressure.

Q Incidentally, have you had any discussions about the operation of the Perma device with its inventor, Mr. Perrino?

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A Oh, yes.

Q Did Mr. Perrino talk to you about lag?

A No. We concentrated on the principles of the system's operation, what it is supposed to do, what it is designed and intended to do and how it actually performed in the field and hence in comparison to our simulations to make sure we were simulating reality.

Q In connection with your discussions of how it performed in the field, did you review any documents which were called field reports and which were prepared by Perma Research & Development Company?

A Yes, I have seen some such, I believe. If I am thinking of what you are thinking of.

Q During the course of these simulations, Mr. De Villiers, were you assuming a constant vacuum source in the underlying vehicle?

A I was assuming an adequate vacuum source.

Q Was it a constant vacuum source?

A Well, I didn't think in terms of vacuum, you know, constant versus not constant, but I -- you are asking me now what I assumed then, and I didn't even really give that aspect of it too much thought.

I was assuming an adequate vacuum source. That is the best I can answer that.

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Q Let me put it another way. Do any of the figures or equations or you may have other terms for them, sir, which I am not familiar with, in Plaintiff's Exhibits 133, 133A, 134 and 135, and I believe also 132, which I don't have before you, concern themselves with vacuum levels in the simulation?

Only indirectly.

Q Let me ask you about that. Is the indirect way in which vacuum is measured in this simulation contained within the activator response time which is numbered 9 on page 2 of Plaintiff's Exhibit 135?

A Yes.

Q Is the activator response time a constant?

A In the real world it might vary some. However, I got that number by studying the --

Q Sir, I didn't ask you where you got the number. I only asked if it was a constant within this simulation.

A Oh, yes, it was a constant within that simulation.

Q If there had been more vacuum available would the Perma-Vac have responded more quickly to signals from the sensing unit?

A Well, the most vacuum you can pull is a complete one. I don't know -- yes, the higher the vacuum, the better.

Q Let's put it another way. What is approximately

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the vacuum level in a 1968 Thunderbird?

A I couldn't answer that. I don't know.

Q Approximately. Is it in the neighborhood of 20 inches of mercury?

A I don't know. I never looked.

Q Let's assume it was 20 inches of mercury and let's assume at 20 inches of mercury it took 30 milliseconds for this activator response time to occur. If there were only 15 inches of mercury available, would it take longer for the same activator response to take place?

A If all the assumptions you are stating were true, I would have to expect yes, it would take longer, and I don't know whether they are true.

Q If it took the activator longer to respond to its signals, would the performance of the unit be in any way affected?

A Not severely.

Q Would it be affected, sir?

THE COURT: I think he said yes, but not severely. That is the way I understood it.

Is that correct?

b4 THE WITNESS: Yes, sir. During the bulk of the operation of the skid control system, of the Perma system, namely when it is under the operation of a governor, what

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is really important is that there is enough vacuum absolutely there to reduce the brake line pressure in the amount that the governor is demanding.

If that much vacuum is there during the operation of the governor, during the higher speed portion of the stop, then this thing is going to work.

Q What does this activator response time in Plaintiff's Exhibit 135 refer to, Mr. De Villiers? Is the --

A It is a time constant, representing the Perma-Vac or similar such devices by what is called a first order device representation.

Q You are getting beyond me, sir. Let me see if I can just simplify it.

MR. DeRENSIS: Let him complete his answer.

MR.LAGEMANN: I am trying for my own understanding, and perhaps yours, to establish something a little different than the way the witness was going.

MR. DeRENSIS: He has interrupted the witness' answer on several occasions and I have let it go. I think at some point he should allow the witness to complete his answer.

THE COURT: Do you have much more to go on this one, Mr. De Villiers?

THE WITNESS: I think I can state that out.

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I am not sure whether it will be intelligible, but I will try.

THE COURT: Go ahead, proceed. If it is not intelligible, I will get after you.

THE WITNESS: The Perma device, the Perma-Vac was modeled as, shall we say, the modeling art would call for as a first order device. This definition has a relationship to the manner in which the device, the output of the device responds to an input. It says basically that if one has a device with which an input X produces an output Y, if the input X, say, is a step, you know, first it is zero, then you raise it to 1, say, then the Y will approach it asymptotically, like that (indicating), like I am modeling with my hand, it won't go through Y, it will approach it in infinity timewise.

An example, for example, is one of these door closers; you walk through a screen door and you open the door and it closes very slowly, but then finally closes.

This time constant which is referred to here as activation time is the amount of time that it will take the device to reach approximately 63 per cent of a demanded change, if you step that change in, and this is a very ordinary way, you know, of simulating such a device.

Q What is the demanded change that you are referring

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to? Where are the two limits?

A If one moves the rotary valve halfway one is desiring to remove half of the brake pressure, so this says, then, that this time constant is going to give the time; in fact, it will take 63 per cent of half of that brake pressure to be removed.

Q In other words, it is the time between the signal and the time that the act it has signaled for is accomplished?

A More or less; it is indicative of that.

Q And that would, of course, apply to each signal, the signal to, for example, relieve pressure and the signal to increase pressure?

A Yes.

MR. DeRENSIS: Object, your Honor. I think it misstates the testimony. It is not to the time the act was completed, but rather to the time that the act is two-thirds completed or 66 per cent completed.

THE COURT: 63 I think.

MR. DeRENSIS: 63 per cent completed.

THE COURT: Yes, I understand.

Q Mr. De Villiers, let's take a look at Plaintiff's Exhibit 122 again and look at statement number C on what is labeled page 8 therein.

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If you will recall that statement refers to fooling the unit.

Is the problem of fooling the unit one which involves the threshold of activation of the anti-skid device?

MR. DeRENSIS: Objection to the word "problem."

THE COURT: I will let it go. I understand.

MR. DeRENSIS: All systems do, your Honor. It is not a problem.

THE COURT: I am well aware.

Go ahead.

A Well, as I mentioned in my direct testimony, I am making an assumption on what Singer wrote down about the meaning of the word fooled.

Do I understand that you interpret the word fooled the way I did or do you have some other interpretation?

Q I heard your prior definition. I might have some others, but as you defined it on direct, is fooling the unit somehow related to the threshold of activation of the unit?

A Well, my understanding of fooling of the unit means that you might be able to get into a skid without the unit finding out about it. That is to me a simple enough definition.

MR. DeRENSIS: Would you let him finish his answer?

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THE WITNESS: I am waiting for more questions.

THE COURT: I think it is complete.

Q All right, let's do it more slowly, then.

I think you said that one could fool the unit by applying the brakes so that they were to lock up, but that they would not exceed the deceleration level needed to arm the unit.

Is that a fair approximation of your definition?

A Yes, that is what I am saying.

Q Now, if the threshold of activation of the unit were higher than the one which you have in your simultation, let us say, 1.92 g. would it be easier or harder to fool the unit on a given tire, road, speed combination?

A If one was really setting out to fool the unit, the person setting out to fool the unit would have a less difficult job.

Q With a higher threshold of activation?

A With the higher threshold of activation.

Q And concurrently, if the threshold of activation were lower, at a lower g, let us just out of the air, for a figure, say, let's say at .75 g, would it be easier -- excuse me -- more difficult for a driver to fool the unit than at .92 g?

A Yes, as the threshold level -- well, I made

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reference in my direct to the low mu situation, the low friction situation, and the closer the threshold of operation might be down to the true -- wait a minute -- the closer that the threshold would be to the true available deceleration from the road, the harder it would be to fool the unit.

THE COURT: Okay, let's stop right there.

These folks here, as perhaps you might have guessed, are not here as spectators. I have another matter on.

MR. LAGEMANN: Your Honor, may I consult for one moment?

b5

THE COURT: Sure.

MR. LAGEMANN: Your Honor, may I have one more minute of questioning?

THE COURT: Sure.

Q Mr. De Villiers, have you provided us today with the program used in the simulations that you ran for Mr. Goor?

A You mean the actual computer program?

Q Yes, that's correct.

A No, I haven't.

MR. LAGEMANN: Your Honor, we would like to ask at this time that the actual computer program be produced,

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and we ask this for several reasons. We have the data and formulas which Mr. De Villiers has provided us in several exhibits. Then, on the other hand, we have the printouts, but we have no way of knowing if these formulas and data actually went into the computer and resulted in what came out, and no way, of course, your Honor, of checking that.

THE COURT: And you have the tapes, too?

MR. LAGEMANN: Yes, we have the tapes. We don't know if the tapes reflect the same data as are contained in the subsequent exhibits. We have no way of checking the accuracy of the program itself. I might add that.

THE COURT: I want to get what kind of tapes you have. Unfortunately, the printout which is referred to as tapes-- is that the tapes that we are talking about or are we talking about the piece of -- what is that tape made out of?

MR. GRAND: They don't have the magnetic tape.

THE COURT: Magnetic tape. But it is made out of something. They don't have it?

MR. GRAND: They have the printouts and they have, as you know from the testimony this morning, they have the basic formulae that went into or were used to derive what went into the computer, but they do not have the specific computer program.

We have not given it to them for a number of reasons,

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among which are the fact that that program, we consider to be proprietary, belonging both to Mr. De Villiers and Goor Associates, and it represents a substantial amount of their private work product. It is not particularly difficult for one skilled in these areas to derive the same kind of program for the materials that have been produced here.

We don't really believe that it is necessary for the cross-examination of this witness. If it does become necessary in the course of the cross-examination, I guess perhaps an appropriate protective order could be formulated.

MR. LAGEMANN: Your Honor, may I just put on the record at this moment that both plaintiff and defendant have agreed that the exhibits in evidence which are coming here on these computer simulations are to be proprietary. We have agreed not to use them except in reference of checking against one another. This same agreement would, of course, hold for the program itself.

THE COURT: All right. Let me think about it.

MR. GRAND: There is one other matter, if I may just bring it up before we adjourn today, because I understand we will not be sitting --

MR. BENBOW: Before you go on, Mr. Grand, could I just say, your Honor, if this is to be of any utility to us in the cross-examination of the witness, I do think we need

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it over this forthcoming break, and as soon as possible.

THE COURT: I will think about it.

Go ahead.

MR. GRAND: I understand, your Honor, we will not be sitting tomorrow, nor will we be sitting next week.

THE COURT: That's right.

MR. GRAND: I have discussed with Mr. Benbow the fact that Mr. De Villiers has a prepaid vacation scheduled to commence on The France, if it isn't in mothballs before then, on the 12th of the month continuing through to Sunday, the 21st, and he would be available to return for cross-examination on the 21st.

However, in view of the delays that have taken place already through the unavoidable delays, I would suggest that we continue the case in his absence during the week commencing the 17th.

It will probably involve only a few minutes more of our case, and I would then suggest that Mr. Benbow go forward with his case.

I mentioned that to him. He is reluctant to do it, but I thought I ougnt to bring it before the court.

MR. BENBOW: If I understood Mr. Grand just now, he has referred to the fact that I understand he has no more case to put on during that time period, and before commencing

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my case, your Honor, I think it is important to have Mr. Grand complete his.

I have, as I think I have apprised the court heretofor, I have serious motions that I intend to offer at the close of Mr. Grand's case, and I would propose to do that, if the court pleases, prior to commencing any defense case.

THE COURT: How many days are we talking about?

MR. GRAND: We are talking about another week. Your Honor will be absent next week and then Mr. De Villiers will be absent the following week, so it would be two weeks instead of one.

THE COURT: Mr. Benbow, can't you go on and as soon as Mr. De Villiers is finished we will take up the motions at that point?

I would assume that any evidence that you are going to put in on the defense case is not going to help the plaintiff establish his case in any way.

MR. BENBOW: I assume it will not, either, your Honor, but it seems to me that since I regard these as serious motions, and I would like to be able to devote my full attention to them while I am preparing them, it will not come conveniently to have to interject that motion in the course of trying to put on my main case.

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In addition to that I do think it would be a waste of all our time to be going forward with our case before we have had an opportunity to prepare and argue those motions.

THE COURT: I don't think so. I don't think there will necessarily be a waste of anyone's time. I think you can do it.

Okay. So I will see you a week from Monday. Have a good holiday.

(Adjourned to April 15, 1974, at 10 A.M.)

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MR. BENBOW: Your Honor, might I just say, in light of your comment, before we go ahead with Mr. Person, that we will make every effort, if the Court is willing to undertake the onerous burden of reading all of those depositions, to both call as few witnesses as we feel necessary and to limit the extent of the testimony from those witnesses that we do call. But in spite of that, as I stated to the Court in the robing room, I am afraid that the defense will be lengthy.

THE COURT: All right. Thank you very much.

- - -

B U R T O N C. P E R S O N, called as a witness by the defendant, having been first duly sworn, testified as follows:

DIRECT EXAMINATION

BY MISS TAYLOR:

Q Will you state your address, please, Mr. Person?

A I live at 6918 South Evanston in Tulsa, Oklahoma.

Q Are you a former employee of the Singer Company?

A Yes, I am.

Q Mr. Person, have you received formal training in engineering?

A Yes, I have.

Q What is your educational background?

A I received a Bachelor of Science degree in metal-

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Q Can you tell me when in 1965 you derived the definition that you have given to the Court?

MISS TAYLOR: Objection. There has been no testimony that it was derived in 1965.

Q When prior to 1965 --

THE COURT: 1965 or prior.

A I don't know that I could name a specific time when I had a definition. I certainly had to have the definition as I picked up this project.

Q Did you talk to the attorney, Mr. Boriss, in conjunction with your having this definition?

A Yes.

Q Did you have the definition formulated in your own mind before you spoke with Mr. Boriss?

A Yes.

Q Was that definition based in any way on your working with any company in the automotive industry?

A No.

Q Prior to 1965 you had no exposure to that industry, is that correct?

A That's correct.

MR. GRAND: I move to strike the definition, your Honor. Whatever it may be based on, it has no relevance to this case, because it's based on experience that has nothing

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THE COURT: Go ahead. He has a present recollection.

Is there anything in your present recollection which is not recorded in that document?

THE WITNESS: Just that the purpose of this meeting was to --

MR. GRAND: I object to what the purpose of the meeting was.

THE COURT: Let's hear it.

THE WITNESS: Was to set the ground rules for this laboratory, who is an important name in the safety field, to evaluate the Perma anti-skid unit.

Q Did the Cornell Aeronautical Institute subsequent to August 10, 1965 submit a proposal for evaluation of the Perma Anti-skid unit?

A Yes, they did.

Q Did Singer go forward with the program defined in the proposal by Cornell Aeronautical Institute?

A No, we did not.

MR. GRAND: I move to strike it if we don't get the proposal.

THE COURT: No, it can stand.

Q Did you have any discussion with Cornell Aernonautical Institute as to why Singer would not go forward

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Q Mr. Person, I believe that during the discussion of your conversation with Mr. diScipio on November 9 you mentioned that Mr. Romel had evaluated Perma's proposed fail-safe modifications and had, if I may summarize, concluded that they would not make the unit fail-safe, is that correct?

A That's correct.

Q The evaluation to which you referred at that time was oral or written, as of November 9, if you know?

A The evaluation as of that time had been presented to me orally.

Q Did there come a time when you were presented with a written evaluation by Mr. Romel and his engineering staff of Mr. Perrino's or Perma's fail-safe proposals?

A Yes.

Q I hand you a document which has been marked as Defendant's Exhibit 529 for identification and ask if you can identify it.

A Yes. This document consists of two parts. The first page is a letter from Mr. Klosy dated November 16, 1965, to me. It forwarded a report which begins on the second page of the document and the following pages dated November 12, 1965, prepared by Mr. Romel covering the fail-safe evaluation of the Perma design modifications.

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It was sent to Mr. Kloby.

Q You mentioned the date November 12. I would like to direct your attention to the third page of Defendant's Exhibit 529 for identification and ask you the date reflected there.

A The date on the top of the third page is November 10, 1965.

Q And the fourth page is also November 10, is that right?

A Yes.

Q Getting further into the document, on the eighth page, entitled "General Analysis of Fail-Safe Transfer Valve Concept," what is the date reflected on that page?

A At the top of that page is the date November 8, 1965.

Q But you note underneath there is something that says "Design received November 10, 1965".

MR. GRAND: My document says November 10 both places.

MISS TAYLOR: Do you see where it says November 8, Mr. Grand?

MR. GRAND: Yes.

A Yes.

Q The next section, entitled "General Analysis of Fail-Safe Transfer Valve Concept, page 3," is I believe dated November 10, right?

A Yes.

MISS TAYLOR: On the engineering topic.

THE COURT: Yes.

THE WITNESS: On this topic, no.

THE COURT: No, all right.

Q Did Perma ever submit any further proposals to cure the technical problems of the device, including the fail-safe problem?

A No.

Q Did Perma ever respond to your letter of December 23, 1965, suggesting a meeting?

MR. GRAND: I will stipulate they didn't.

A No.

Q Did there come a time when Singer removed certain personnel from the Perma project?

A Yes.

Q Approximately when was that?

MR. GRAND: I object to that, your Honor. As Singer's efforts have long ceased by this date. To push it off later, after conferring with lawyers --

THE COURT: Let's find out where it is going. When?

THE WITNESS: It was the end of January that the --

THE COURT: Of what, 1965?

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Q Did there come a time when you met with representatives of Kelsey-Hayes with respect to their evaluation of the Perma device?

A Yes.

Q Do you recall when that meeting took place?

THE COURT: Do you know the date?

MISS TAYLOR: Yes. February 3rd, as reflected --

THE COURT: Did you have the meeting on February 3rd?

THE WITNESS: Yes.

Q I hand you Defendant's Exhibit 335 for identification and ask if you would identify it.

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A This document is composed of two parts. The first page is a memorandum prepared by me, dated February 15, 1966, covering the highlights of the meeting with Kelsey-Hayes on February 3rd.

The second, third and fourth pages of the document is a memorandum prepared by Mr. Every of Kelsey-Hayes, dated February 3, 1966, sent to a Mr. Meyer, and it was the evaluation of the Perma anti-skid system.

The fifth, sixth, seventh, eighth and ninth pages appear to be a clean transcription of the memorandum from Mr. Every to Mr. Meyer.

MISS TAYLOR: Your Honor, the memorandum itself is very unclear, so we have taken the liberty of having it retyped.

THE COURT: Mr. Grand, do you object to this document being received?

MR. GRAND: I do, your Honor.

THE COURT: All right, fine. Wait until tomorrow morning. You will have your voir dire then.

I believe it is your testimony that on or about November 9, 1965 a decision was made to divest the Singer Company of the Perma anti-skid program; is that correct?

THE WITNESS: It is not quite correct. If I might, the decision was made to begin exploring programs

for divestiture, to begin gathering facts. There was no commitment. There would not have been a commitment made, you know, without a specific proposal.

MISS TAYLOR: I believe we were at the point of Mr. Grand doing a voir dire on the Defendant's Exhibit 335 for identification.

THE COURT: Yes.

MR. GRAND: Your Honor, I may be able to shortcut

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it by simply stating an objection without a voir dire.

MISS TAYLOR: Can't hear you, Mr. Grand.

THE COURT: Come on up.

MR. GRAND: I said I may be able to shortcut it by stating an objection without a voir dire.

This document and the attachment to it, the so-called Kelsey-Hayes evaluation, is the rankest kind of hearsay.

As was brought out yesterday, the document was not prepared until February 3, 1966. The Kelsey-Hayes document the Person Memorandum, was prepared February 15, 1966.

Even by Singer's own testimony that is some two to three weeks after all the personnel assigned to the project have been pulled off of it.

We have now evidence that the decision to divest was made not later than November 9. The people are pulled off the project by January and thereafter Singer obtained information.

Clearly, they are obtaining the information in the course of their attempts to sell the device to various entities Kelsey-Hayes is one. Ford is another. There may be another.

And now, whatever the reasons may be that Kelsey-Hayes or Ford or somebody else may have not decided to purchase all or part of the Perma device, Singer now wants to

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introduce that before the Court to have the Court consider as a reason that Singer terminated its program.

It clearly is not probative of that. The decisions had been made long earlier.

The matters are the rankest kind of hearsay.

If this kind of information is to be offered, it should be offered through somebody who is cross-examinable on it, somebody who was present when the tests took place, assuming that those tests had any relevancy whatever.

I object to it.

THE COURT: Let me see it.

MISS TAYLOR: Your Honor --

THE COURT: Let me see it.

Go ahead.

MISS TAYLOR: First of all, I think that the crucial point which Mr. Grand has left out is that this document, the Kelsey-Hayes analysis, is dated February 3, 1966. The memorandum from Mr. Person to Messrs. Boriss, Broeker and Elman is dated February 15, 1966, and the present lawsuit was not commenced until March of 1966. It is clearly an evaluation prior to this litigation.

Secondly, to the extent that Mr. Grand is arguing that ligitation may have been contemplated, I would point out that the document, the Kelsey-Hayes report, was not prepared

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by Singer but rather prepared by Kelsey-Hayes.

It is our position that this is a business record, prepared in the normal course of business by Kelsey-Hayes.

THE COURT: A business record?

MR. GRAND: What proof is there of that, even if it were?

MISS TAYLOR: And as such might be an exception to the hearsay rule.

MR. GRAND: Your Honor, it seems to me the only conceivable way of --

THE COURT: No, no, no.

MISS TAYLOR: May I speak further, your Honor?

THE COURT: Surely. Go ahead.

MISS TAYLOR: Even if the document were not admitted for the truth of the matters stated therein, as I believe it should be, it certainly is relevant to show the state of mind of Mr. Person.

As you will note, there is an apparent exception to the hearsay rule when a document is received to show the state of mind of the recipient.

In that regard I would cite perhaps Richardson on evidence, Section 205, and I believe that inasmuch as Kelsey-Hayes' evaluation was that the device offered no improvement in the normal braking system, not recommend any further

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testing or development work with the Perma device, this information which Mr. Person received in February of 1966 is certainly relevant to the appropriateness of Singer's discontinuation of its efforts to further develop the device prior to the lawsuit.

MR. GRAND: In November 1965. I object to it, your Honor.

MISS TAYLOR: Your Honor, I think we can establish--

THE COURT: Objection sustained.

DIRECT EXAMINATION

BY MISS TAYLOR (CONTINUED):

Q Upon receiving a report from the Kelsey-Hayes Company on February 3, 1966, did you reach any conclusions as to whether the Perma device should be further developed by the Singer Company?

MR. GRAND: I object, your Honor. Whether he did or didn't is completely irrelevant.

THE COURT: I thought he reached that conclusion November 9. That is what his testimony was.

MR. GRAND: Correct. Action was taken -- no action was taken after February --

MISS TAYLOR: Your Honor, I believe that the report was obtained for two purposes; one, to determine a potential buyer, but, secondly, and I feel most importantly, was to get

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a technical evaluation of the device.

If these third parties, such as Kelsey-Hayes, who we have heard so much about, were of the opinion that the Perma device could perhaps within the confines of the patents be improved so as to make it marketable, I believe that the Singer Company would have taken such a step or may have taken such a step.

The fact that Kelsey-Hayes rendered an engineering report, not just a decision not to buy this device, is certainly relevant to the appropriateness of Singer's steps in discontinuing its developmental work.

-1-2 MR. GRAND: There's lots of things wrong with that, your Honor, one of which is there is certainly no indication --

THE COURT: I am well aware of it. No, I am not going to permit it.

MISS TAYLOR: I couldn't hear you.

THE COURT: I said, no, I am not going to permit it.

BY MISS TAYLOR:

Q In February of 1966, did Singer conduct any further testing or developmental work with respect to the Perma device, to your knowledge?

MR. GRAND: I also object, your Honor, as irrelevant in any issue.

THE COURT: No, I will permit it. Let's see what the answer to that is.

A In February 19 --

THE COURT: '66.

A Yes.

Q Yes?

A Yes. We brought the unit to the Ford Company for evaluation.

MR. GRAND: I object to that as not responsive. That is not what Singer did.

THE COURT: That is not responsive at all. The question is did Singer do anything?

Q Other than the seeking of evaluations of the device by third parties?

A Not to my recollection.

Q Do you know the reason why Singer didn't conduct any further testing and development of the Perma device as of February 3, 1966?

MR. GRAND: I object, your Honor.

THE COURT: Sustained. The decision was made on November 9, is that correct, to look into a program of divesture of this particular program?

THE WITNESS: It was a decision to look into a program of divesture on November 9, but we also continued our

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engineering work.

Q In the event that the Perma device had been perfected as a result of the continuing engineering work after November 9 --

MR. GRAND: Your Honor --

MISS TAYLOR: May I finish my question, Mr. Grand?

MR. GRAND: Excuse me.

Q -- did Singer have a definite commitment to divest the project?

MR. GRAND: I object.

THE COURT: Let him answer it. Go ahead.

A No.

Q In other words, had the device been perfectable and had Singer succeeded in having the device perfected, Singer might well have gone forward with the project?

A Yes.

MR. GRAND: And they might well have not, I suspect.

THE COURT: Sustained.

MR. GRAND: I move to strike the answer.

THE COURT: Answer stricken.

Q To your knowledge, was Singer seeking the evaluation of Kelsey-Hayes in order not only to elicit their interest in possibly purchasing the Perma project but also to obtain their opinion as to the prospects for perfecting the device

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from an engineering point of view?

MR. GRAND: Object to that. I don't know whose state of mind we are eliciting or seeking to elicit. We did not have a person attached to it. Whoever it is, it is irrelevant.

THE COURT: Let me ask a question.

I will sustain the objection.

Did you pay Kelsey-Hayes or did Singer pay Kelsey-Hayes for its evaluation?

THE WITNESS: No.

Q To your knowledge, did Kelsey-Hayes conduct an engineering evaluation as opposed to and perhaps in addition to an evaluation as to whether or not they would care to purchase the project?

THE COURT: Answer it yes or no.

MR. GRAND: I object to this. This is an indirect way of trying to get in --

THE COURT: He can answer it yes or no.

A My recollection is they did conduct an engineering evaluation.

Q To your knowledge, were the results of the engineering evaluation conveyed to Mr. Romel, the chief engineer on the Perma project?

A Yes.

MR. GRAND: I object to that too, your Honor.

THE COURT: It doesn't matter. The answer is ~~yet~~ (yes).

Q And those results were conveyed at the meeting to which you have referred on February 3, 1966, is that correct?

MR. GRAND: Objection.

THE COURT: It doesn't matter. I assume it was.

A Yes.

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MISS TAYLOR: Your Honor, I would like to renew my request. I feel that this is extremely relevant, the receipt of a negative report, to his state of mind and the actions of the Singer Company prior to commencement of the lawsuit.

If best efforts to perfect are in fact an issue, and we contend they are not, the conclusion of a leading company that the device was not perfectible could not be more relevant.

MR. GRAND: First of all --

THE COURT: If we get a conclusion we will get it from somebody else, not from this witness.

MISS TAYLOR: My position, your Honor, is this goes to his state of mind. Whether or not the device had the results as indicated in this report may be one question, but his state of mind when he received these negative reports is a different issue.

So I am not offering it at this time for the truth of, for example, the length of the stopping distance and so forth, but rather to show his state of mind upon reading this negative evaluation.

MR. GRAND: You want me to argue my objection, your Honor.

THE COURT: No.

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MISS TAYLOR: My problem, your Honor, is that I can't understand how it can be hearsay if I am not offering it for the truth of the matters asserted therein.

THE COURT: I didn't say it was hearsay.

MISS TAYLOR: That was Mr. Grand's objection.

MR. GRAND: One part of my objection.

BY MISS TAYLOR:

Q To your knowledge, was there any decision at any time by Singer to discontinue developmental efforts on a perfectible anti-skid device? By that I mean what Singer considered to be a perfectible device.

MR. GRAND: I object to that question.

Q A device which could be made fail-safe within the confines of the Perma patents and could have the other technical problems cured.

MR. GRAND: I don't even think we have a question now.

THE COURT: Let's see if the witness understands it.

MR. GRAND: I don't understand it. I don't mean that captiously. I don't understand what the question is.

THE COURT: Read it back.

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(Record read)

A To my knowledge, there was no decision to stop on a device that would have been perfectible.

THE COURT: Was there a decision ever made to stop on the Perma device?

THE WITNESS: Yes, sir.

Q What is the basis of the decision to stop developmental work on the Perma device --

MR. GRAND: I object to this.

Q -- a belief that the Perma device could not be made fail-safe and be perfected in other engineering aspects?

MR. GRAND: Objection.

THE COURT: Isn't that in the document from November 9? Why do we need it again?

MISS TAYLOR: Because I believe the decision to discontinue developmental efforts was not made until January 26, 1966. As far as developmental efforts and engineering work --

THE COURT: All right. You want to say it is January 26, 1966.

MISS TAYLOR: That's correct.

THE COURT: Fine.

MISS TAYLOR: Subsequent to that time there

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was additional evaluation, but not additional work at the Elizabeth factory.

MR. GRAND: Even from their point of view --

THE COURT: I am at a total loss.

MISS TAYLOR: Your Honor, if I may --

THE COURT: Let me ask the witness. You presently hold a position ina fairly large corporation, right?

THE WITNESS: Right.

THE COURT: In that position you are called upon to make decisions from time to time, is that correct?

THE WITNESS: That's correct.

THE COURT: Once you make a decision to stop a particular thing, do you stop it or don't you, a particular program that you are involved in?

THE WITNESS: I think we would have to define, you know, what it is we are stopping.

THE COURT: You are stopping a program.

THE WITNESS: And whether the stopping is temporary.

THE COURT: All right.

THE WITNESS: You may stop --

THE COURT: All right. Let us suggest that

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you have a program you think can never be marketable, can never bring in any profits to the corporation.

Do you continue the operation of that program?

THE WITNESS: As long as you -- I would continue any efforts that looked like they would recoup some of the investment or, you know, had a chance of solving whatever the business problem was.

THE COURT: In other words, you would do it to save corporate assets in the sense that you could recoup something?

THE WITNESS: That would be part of my reason for doing it.

THE COURT: What is the other part?

THE WITNESS: Part of it would be to prove to -- if this was a program with heavy loss implications part of it would be to prove to your management that you did the very best that you could with -- given a certain set, you know, of situations.

THE COURT: How about the stockholders?

THE WITNESS: Certainly in a large corporation, in the interest of the stockholders, you have got to, I feel, explore every avenue to preserve that investment or those assets.

THE COURT: Not just to prove to management

that your decision was right?

THE WITNESS: No.

THE COURT: All right.

MISS TAYLOR: Can I ask a follow-up question on that?

THE COURT: Sure.

BY MISS TAYLOR:

Q If you had concluded that a product which your company had undertaken to market could not, for a number of reasons, be marketed in that it was not perfected, and you had received a number of evaluations indicating that that device could not be perfected from within your own company, might not you seek confirmation of your company's evaluation from outside sources?

MR. GRAND: That is the question.

MISS TAYLOR: Yes.

MR. GRAND: I object to it.

THE COURT: I will let it go. Go ahead.

A As long as there were no proprietary secrets that I was concerned about releasing, I would seek all the counsel I could get on that unit, on that product.